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# THE ANNALS

AND

# MAGAZINE OF NATURAL HISTORY,

INCLUDING

## ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

SIR A. SMITH WOODWARD, LL.D., F.R.S., F.G.S.,
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### VOL. VIII.—TENTH SERIES.

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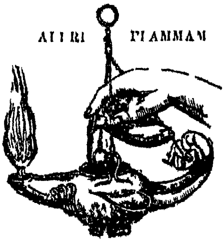
"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris, ex pulchritudine *sapientia* Domini, ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata, à vere eruditis et sapientibus semper exculta, male doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . . . . . . . . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands
And odorous branches at our feet, the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.
J. TAYLOR, *Norwich*, 1818.



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# THE ANNALS

AND

# MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

> "................... per litora spargite muscum
> Naiades, et circùm vitreos considite fontes:
> Pollice virgineo teneros hic carpite flores:
> Floribus et pictum, divæ, replete canistrum.
> At vos, o Nymphæ Craterides, ite sub undas
> Ite, recurvato variata corallia trunco
> Vellite muscosis e rupibus, et mihi conchas
> Ferte, Deæ pelagi, et pingui conchylia succo."
>
> *N. Parthenii Giannettasi*, Ecl. 1.

No. 43. JULY 1931.

## I.—*Notes on a Collection of Ethiopian Oryssoidea and Tenthredinoidea (Insecta: Hymenoptera).* By Dr. RUNAR FORSIUS, Kottby, Finland.

THROUGH the courtesy of Mr. Robert B. Benson, of the British Museum, I received for study some time ago the whole of the undetermined material of the Ethiopian Oryssoidea and Tenthredinoidea belonging to the Museum. For this kindness I am very grateful to him, because I intend to write a monographical study of the African fauna, and I am therefore extremely interested to see as many of these insects as possible.

The material from the British Museum was comparatively rich, and contained representatives of no less than 73 species and 5 varieties, divided among 12 genera. Of these, one genus, twelve species, and two varieties were hitherto unknown to science. All except two of these are described in this treatise. Because the distribution of Ethiopian Oryssoidea and Tenthredinoidea is so very little known, it appeared to me to be necessary to publish all the localities of the specimens sent, as well as all the other data and information available to me.

The genera and species are mainly arranged according to Konow's and Rohwer's systems. The treatise begins with a full list of specimens arranged systematically, and then follow descriptions of the new forms and notes regarding certain otherwise remarkable species. The whole of the material dealt with has been returned to the British Museum.

## I.—List of hitherto undetermined African Oryssoidea and Tenthredinoidea in the British Museum.

### Superfamily **ORYSSOIDEA**, Rohwer.

### Genus Chalinus, Konow.

*Chalinus haugi*, Buysson.

Uganda: Mabira Forest, Chagwe, 3500–3800 ft., 16–25. vii. 1911, 1 ♀ (*S. A. Neave*).

### Superfamily **TENTHREDINOIDEA**, Rohwer.

### Family **Argidæ**, Rohwer.

### Genus Arge, Schrank.

*Arge sugillata*, Klug.

S. Africa—Cape Province: 1 ♀ (*Dr. Smith*, 1844–6); Grahamstown, x. 1903, 1 ♀ (*Miss M. Daly and M. Sole*); Mossel Bay, vi. 1921–iii. 1922, 5 ♂, 2 ♀ (*R. E. Turner*); Port St. John, Pondoland, v.–xi. 1923, 3 ♂ (*R. E. Turner*).

*Arge capensis*, Klug.

S. Africa—Cape Province: Mossel Bay, iii. 1921 & xii. 1921, 3 ♂ (*R. E. Turner*); Rapenburg, Cape Flats, 1–14. x. 1920, 1 ♂ (*R. E. Turner*).

*Arge andromeda*, Kirby.

S. Africa—Natal: Durban, xii. 1901, 1 ♀, bred (*G. F. Leich*); Kloof, 1500 ft., ix. 1926, 1 ♂ (*R. E. Turner*).

S. Africa—Cape Province: Port St. John, Pondoland, 15. viii.–xi. 1923, 6 ♂ (*R. E. Turner*).

*Arge speciosa*, Klug.

S. Africa—Natal: Durban, 1902, 1 ♀ (*F. Muir*), iv. 1914, 1 ♀ (*Miss J. Brincker*); Tongaat, 1909, 1 ♀ (*H. C. Burnup*).

*Arge nausicaa*, Enslin.

PORTUGUESE E. AFRICA: Delagoa Bay, 1 ♀ (*Mrs. Mouteiro*).

*Arge incerta*, sp. n.

S. AFRICA—TRANSVAAL: Barberton, 1 ♀ (*P. Rendall*, Distant Coll. 1911, 383).

*Arge mirabilis*, sp. n.

NYASALAND: Chiromo, 1 ♀ (*R. C. Wood*).

*Arge schulthessi*, Konow.

TANGANYIKA: Tanga, 2–13. ix. 1917, 9 ♀ (*W. A. Lamborn*).

*Arge neavei*, Forsius.

NYASALAND: Mlanje, 2. i. 1914, 1 ♀ (*S. A. Neave*).

*Arge marshalli*, Forsius.

KENYA: Mumias, 4200 ft., 15. vi. 1911, 1 ♀, without head (*S. A. Neave*).

*Arge bequaerti*, Enslin.

CAMEROONS: Buaer, 10–29. v. 1914, 1 ♀.

*Arge flavifrons*, Mocsary.

S. AFRICA—TRANSVAAL: Pretoria, 1 ♀ (*W. L. Distant*, 1911, 383).

*Arge nigripes*, Klug.

S. AFRICA—NATAL: 1 ♂ (*J. P. Cregoe*, 1903, 213); Van Reenen, Drakensberg, 5500–6500 ft., x. 1926, 1 ♂ (*R. E. Turner*).

S. AFRICA—CAPE PROVINCE: Port St. John, Pondoland, 1–5. iv. 1923, 1 ♀ (*R. E. Turner*); Cape Town, 1858–59, 1 ♂ (*R. Trimen*); Cape Peninsula, Camps Bay, 1–20. x. 1920, 1 ♂ (*R. E. Turner*).

*Arge stictica*, Klug.

S. AFRICA—NATAL: Durban, 1 ♂ (*F. Muir*, 1921, 134); 1 ♂ (Gueinzius Coll. 1858, 13).

### *Arge furvipes*, Konow.

S. Africa—Natal: Howick, 2 ♀ (*J. P. Cregoe*, 1903, 213; 1904, 46); Van Reenen, Drakensberg, 1–22. i. 1927, 2 ♂, xi. 1926, 1 ♂ (*R. E. Turner*).

S. Africa—Cape Province: Robinson Pass, between Mossel Bay and Oudtshoorn, 8. xii. 1921, 2 ♂, 3 ♀ (*R. E. Turner*); Witzenburg Valley, 3000 ft., 19. i. 1921, 1 ♂ (*R. E. Turner*).

### *Arge stuhlmanni*, Konow.

Nyasaland: Blantyre, 1914, 1 ♀ (*Dr. J. B. Davey*); Domira Bay, 1670 ft., 1916, 4 ♂, 1 ♀ (*W. A. Lamborn*); Mlanji, Boma, 2400 ft., 26. iv.–30. v. 1910, 1 ♀ (*S. A. Neave*).

S. Africa—Natal: Empangeni, Zululand, 26. iv. 1926, 1 ♂ (*R. E. Turner*).

S.W. Africa: Okahandja, 3. ii.–18. iii. 1928, 1 ♂, 2 ♀ (*R. E. Turner*).

### *Arge xanthomela*, Klug.

Nyasaland: Blantyre, about 3000 ft., 7–11. iv. 1910, 1 ♀ (*S. A. Neave*).

N. Rhodesia: Serenje District, about 4500 ft., 23. xii. 1907, 1 ♂, 1 ♀ (*S. A. Neave*).

### *Arge petacacia*, Konow.

Uganda: Kampala, 1–10. i. 1918, 1 ♂, 7–11. iv. 1929, 1 ♀ (*C. C. Gowdey*); S. Toro, Mbarara, Ft. Portal Road, 3800–4200 ft., 22–24. x. 1911, 1 ♀ (*S. A. Neave*).

Nyasaland: Chiromo, 17–20. iv. 1910, 1 ♀ (*S. A. Neave*).

### *Arge bisignata*, Konow.

Portuguese E. Africa: Delagoa Bay, 1 ♂ (1886, 20), belongs probably to this species.

### *Arge massajæ*, Gribodo.

Abyssinia: Harrar District, 2 ♂ (*G. Kristensen*, 1911, 459).

Kenya: Mount Kenya, west slopes of, on Meru–Nyeri Road, 6000–8500 ft., 16–23. ii. 1911, 3 ♂ (*S. A. Neave*); Kikuyu Escarpment, Kijabe to Limuru, 6800–7400 ft., 6–10. iii. 1911, 1 ♂ (*S. A. Neave*).

### *Arge annulipes*, Klug.

S. Africa—Transvaal : Sterkfontein, 1 ♀ (*H. P. Thomasset*, 1899, 1291).

S. Africa—Natal : Durban, 1902, 1 ♂ (*F. Muir*) ; Durban, 1 ♂, 1 ♀ (Gueinzius Coll. 1860, 97) ; Howick, 1 ♀ (*S. P. Cregoe*, 1903, 213) ; Van Reenen, Drakensberg, 5500–6500 ft., x. 1926–22. i. 1927, 1 ♂, 1 ♀ (*R. E. Turner*) ; Tongaat, 1909, 1 ♀ (*H. C. Burnup*).

S. Africa—Cape Province : Port St. John, Pondoland, 1–5. iv. 1923, 1 ♀, 15–31. viii. 1923, 1 ♀ (*R. E. Turner*) ; Robinson Pass, between Mossel Bay and Oudtshoorn, 8. xii. 1921, 1 ♀ (*R. E. Turner*).

### *Arge congonensis*, Enslin.

Nyasaland : Lake Nyasa, south-west shore, between Fort Johnson and Monkey Bay, 1650 ft., 25. ii.–4. iii. 1910, 3 ♂, 7 ♀ (*S. A. Neave*).

### *Arge* (*Didocha*) *hansi*, Forsius.

S. Africa—Cape Province: Aliwal North, xii. 1922, 1 ♂ (*R. E. Turner*).

## Genus Triarge, nov.

### *Triarge plumbea*, sp. n.

S. Africa—Cape Province : Ceres, 1–12. xi. 1924, 1 ♂, 1 ♀ (*R. E. Turner*) ; Mossel Bay, v.–viii. 1921, 1 ♂, 1 ♀ (*R. E. Turner*).

## Genus Sjoestedtia, Konow.

### *Sjoestedtia meruensis*, Konow.

Kenya : Mombasa, 1 ♀ (*A. J. Cholmley*, 1906, 255).

Uganda : Northern Buddu, 3800 ft., 16–18. ix. 1911, 1 ♀ (*S. A. Neave*) ; Entebbe Forest, 3800 ft., 5–11. vii. 1911, 1 ♀ (*S. A. Neave*) ; Mount Kokanjero, south-west of Elgon, 6400 ft., 7–8. viii. 1911, 1 ♂, 7 ♀ (*S. A. Neave*) ; Mpanga Forest, Toro, 4800 ft., 13–23. xi. 1911, 1 ♀ (*S. A. Neave*) ; Mabira Forest, Chagwe, 3500–3800 ft., 16–25. vii. 1911, 2 ♀ (*S. A. Neave*) ; Lake Matando, 1 ♀ (*C. H. Marshall*, 1912, 528) ; Mpanga Forest, Toro, 4800 ft., 13–23. xi. 1911, 1 ♀ (*S. A. Neave*).

### *Sjoestedtia æthiopica*, Enslin.

Kenya : Lake Mutanda, 1 ♀ (*Robin Kemp*, 1918, 51).

## Family Tenthredinidæ, Rohwer.

### Subfamily *Tenthredininæ*, Enslin.

### Tribe Selandriini, Enslin.

### Genus Athalia, Leach.

#### *Athalia turneri*, sp. n.

South-west Africa: Okahandja, 10–16. ii. 1928, 1 ♀ (*R. E. Turner*).

#### *Athalia zanzibarica*, sp. n.

Zanzibar: Pemba Island, 15–23. ix. 1924, 1 ♂ (*H. J. Smith*).

#### *Athalia malagassa*, Sauss.

Madagascar: Fort Dauphin, 1 ♀ (*J. Cloisel*, 1891, 158).

#### *Athalia dissona*, Konow.

Sierra Leone: Waterloo, vii. 1924, 1 ♀ (*A. Blacklock*).

Nyasaland: Fort Johnston, 1 ♀ (*P. Rendall*, Distant Coll. 1911, 383); Mount Mlanje, 8–21. xi. 1912, 2 ♀ (*S. A. Neave*).

South Africa—Cape Province: Aliwal North, xii. 1922, 1 ♂, 1 ♀ (*R. E. Turner*).

#### *Athalia dissona*, var. *shoutedeni*, Forsius.

Uganda: Kampala, 10–19. xi. 1917, 1 ♀ (*C. C. Gowdey*).

Belgian Congo: Katanga, south-east of, 4000 ft., 29. xi. 1907, 1 ♀ (*S. A. Neave*).

South Rhodesia: Chirinda Forest, 25. iii.–2. v. 1907, 1 ♀ (*C. F. M. Swynnerton*).

South Africa—Orange Free State: Harrismith, ii. 1927, 1 ♂ (*R. E. Turner*).

South Africa—Cape Province: Port St. John, Pondoland, 25–31. iii. 1923, 1 ♂ (*R. E. Turner*); Queenstown, 3500 ft., 16. i.–10. ii. 1923, 1 ♂ (*R. E. Turner*).

#### *Athalia dissona*, var. *concors*, Konow.

Uganda: Kampala, 12–20. iii. 1918, 1 ♂ (*C. C. Gowdey*).

Nyasaland: Mount Mlanje, 20. xi. 1917, 1 ♂, 1 ♀ (*S. A. Neave*); Zomba, 1 ♀ (*H. S. Stannus*, 1919, 293).

Portuguese East Africa: Delagoa Bay, 1 ♀ (*Mrs. Moutiero*, 1886, 20).

### *Athalia dissona*, var. *mashonensis*, Enslin.

Kenya : Lulanguru, xi. 1917, 1 ♀ (*C. D. H. Carpenter*).

### *Athalia scioensis*, Gribodo.

Kenya : Embu, Chuka Station, "on grass in sunshine," 4800 ft., 8. vi. 1914, 1 ♀ (*G. St. J. O. Browne*) ; Nairobi, vi.–vii. 1912, 1 ♀ (*A. D. Milne*).

Uganda : Kampala, 10–24. ii. 1905, 1 ♂, 1 ♀ (*C. C. Gowdey*).

### *Athalia ustipennis*, Mocsary.

Kenya : Kisumu, Port Florence, 22–24. iv. 1911, 1 ♂ (*S. A. Neave*).

Uganda : 1918, 1 ♀ (*C. C. Gowdey*) ; Kampala, 10–24. ii. 1915, 1 ♀, 6–14. vi. 1916, 1 ♀, 10–12. xii. 1917, 1 ♀ (*C. C. Gowdey*) ; between Jinja and Busia or Mbwago's E. Busonga (forest), 3800–4000 ft., 28. vii.–i. 1911, 1 ♀ (*S. A. Neave*).

Nyasaland : Dedca District, Central Agoniland, 4000–5000 ft., 21–27. v. 1910, 3 ♂ (*S. A. Neave*).

South Africa—Natal : Van Reenen, Drakensberg, 1–22. i. 1927, 1 ♂ (*R. E. Turner*).

### *Athalia incompta*, Konow.

Uganda : Kampala, 12–20. iii. 1918, 1 ♀ (*C. C. Gowdey*).

Nyasaland : Zomba, xi.–xii. 1911, 1 ♀ (*R. Drummond*).

South Rhodesia : Salisbury, i. 1902, 1 ♂ (*G. A. Marshall*).

Portuguese East Africa : Delagoa Bay, 1 ♂ (1883, 27).

South Africa—Transvaal : Piet Retief, 1 ♂, 3 ♀ (*R. Crawshay*), 1904, 44) ; Watervall, 5. xii. 1899, 1 ♂ (P. Cameron Coll.) ; Zoutpansberg, Kaessener, 1 ♂ (Distant Coll. 1911, 383).

South Africa—Natal : Durban, 1902, 4 ♂ (*F. Muir*) ; Kloof, ix. 1926, 2 ♂ (*R. E. Turner*) ; Van Reenen, Drakensberg, xi.–xii. 1926, 4 ♂, 1 ♀ (*R. E. Turner*) ; Weenen, iii. 1925, 1 ♀ (*H. P. Thomasset*) ; Zululand, Eshowe, 23–30, iv. 1926, 3 ♂ (*R. E. Turner*).

South Africa—Orange Free State : Harrismith, ii. 1927, 1 ♂ (*R. E. Turner*).

South Africa—Cape Province : Aliwal North, xii. 1922, 3 ♂, 7 ♀ (*R. E. Turner*) ; Port St. John, Pondoland, 5. iv.–31. v. 1923, 5 ♂ (*R. E. Turner*) ; Queenstown, 3500 ft., 16. i.–10. ii. 1923, 1 ♂ (*R. E. Turner*) ; Umtata, Transkei, 18. ii.–18. iii. 1923, 1 ♂, 2 ♀ (*R. E. Turner*).

*Athalia abyssinica*, sp. n.

Abyssinia : Harrar, 1 ♀ (*G. Kristensen*, 1912, 21).

*Athalia flacca*, Konow.

Kenya : Mount Kenya, south-east slopes of, 6000–7000 ft., 8–12. ii. 1911, 1 ♀ (*S. A. Neave*) ; Masai Reserve, 14–27. i. 1914, 1 ♂ (*Capt. A. O. Luckman*).

Uganda : Ankole, south-east of, 4400–4800 ft., 4–8. x. 1911, 1 ♀ (*S. A. Neave*) ; Mt. Kokanjaro, south-west of Elgon, 6400 ft., 7–9. viii. 1911, 1 ♀ (*S. A. Neave*) ; Toro Forest, south-east of Buddu, 3800 ft., 26–30. ix. 1911, 1 ♀ (*S. A. Neave*).

Nyasaland : Blantyre, 5. v. 1910, 1 ♀ (*T. E. S. Old*) ; Chiromo, 1 ♀ (*R. C. Wood*, 1917, 134).

Portuguese East Africa : Delagoa Bay, 1 ♂ (*Mrs. Moutiero*, 1886, 20).

South Africa—Natal : Durban, 1902, 1 ♂ (*F. Muir*) ; Kloof, Zuster Stop, 14. ix. 1904, 1 ♀ (P. Cameron Coll.) ; Maritzburg, Boshops Road, xii. 1909, 1 ♂ (*F. Warren*) ; Umbilo, 14. vi. 1914, 1 ♂ (*L. Bevis*) ; Umtata, Transkei, 18. ii.–18. iii. 1923, 1 ♀ (*R. E. Turner*) ; Van Reenen, Drakensberg, 5500–6500 ft., x. 1926–22. i. 1927, 3 ♂ (*R. E. Turner*).

South Africa—Cape Province : Port St. John, Pondoland, 5. iv.–11. vi. 1923, 4 ♂, 1 ♀ (*R. E. Turner*).

*Athalia clavata*, Konow.

Kenya : Aberdare Mountains, foot and slopes, 7000–8500 ft., 24–27. ii. 1911, 5 ♂, 2 ♀ (*S. A. Neave*) ; Mount Kenya, west slopes of, Meru–Nyeri Road, 6000–8500 ft., 16–23. ii. 1911, 3 ♂, 1 ♀ (*S. A. Neave*) ; Masai Reserve, 12–27. i. 1914, 1 ♂ (*A. O. Luckman*) ; Masai Reserve, Man–Narok, 8000 ft., 19. i. 1914, 3 ♂ (*A. O. Luckman*) ; Nandi Plateau (some forest), 5700–6200 ft., 30. v.–4. vi. 1911, 1 ♀ (*S. A. Neave*).

Uganda : Budongo Forest, Unyoro, 3400 ft., 11–15. xii. 1911, 1 ♀ (*S. A. Neave*) ; Kampala, 10–19. xi. 1917, 1 ♂, 10–12. xii. 1917, 1 ♀ (*C. C. Gowdey*) ; Mabira Forest, Chagwe, 17–20. vii. 1911, 1 ♀ (*C. C. Gowdey*) ; Mabira Forest, Chagwe, 3500–3800 ft., 16–25. vii. 1911, 2 ♀ (*S. A. Neave*).

Tanganyika : New Lagenberg, 1 ♀ (*H. S. Stannus*, 1919, 314).

South Africa—Natal : Kloof, 1500 ft., viii. 1926, 1 ♀ (*R. E. Turner*).

*Athalia furvipennis*, Konow.

KENYA: Aberdare Mountains, foot and slopes of, 7000–8500 ft., 21–27. ii. 1911, 2 ♂ (*S. A. Neave*); Mount Kenya, west slopes of, on Meru–Nyeri Road, 6000–8500 ft., 16–25. ii. 1911, 1 ♂ (*S. A. Neave*); Mount Kenya, south-east slopes of, 6000–7000 ft., 3–12. ii. 1911, 2 ♀ (*S. A. Neave*); Kikuyu Escarpment, Kijabe to Limoru, Uganda Road, 6800–7400 ft., 6–10. iii. 1911, 1 ♀ (*S. A. Neave*).

UGANDA: North Kokonjero, 22. xii. 1910, 1 ♂ (*C. C. Gowdey*); Lake MuFanga, 10. iii. 1911, 1 ♀ (*C. H. Marshall*); Mpanga Forest, Toro, 4800 ft., 17–23. xi. 1911, 1 ♀ (*S. A. Neave*); N. Ruwenzori, 6000–8500 ft., 12. xi. 1911, 1 ♂ (*S. A. Neave*).

*Athalia fumosa*, Gribodo.

KENYA: Mount Kenya, west slopes of, on Meru–Nyeri Road, 6000–8500 ft., 16–23. ii. 1911, 1 ♀ (*S. A. Neave*).

*Athalia truncata*, Enslin (=*bicolor*, Sauss., nec Lep.).

KENYA: Masai Reserve, Leinck Valley, 5000 ft., 17. ii. 1914, 1 ♂ (*A. O. Luckman*).

UGANDA: Kampala, 7–11. iv. 1917, 1 ♀, 1. vi. 1919, 1 ♂ (*C. C. Gowdey*).

BELGIAN CONGO: Katanga, Lufira, 3500 ft., 14. viii. 1907, 1 ♂ (*S. A. Neave*).

SOUTH RHODESIA: Mashonaland, Salisbury, x. 1899, 1 ♂ (*G. A. K. Marshall*); Mashonaland, Salisbury, 21. ii. 1912, 1 ♂, 1 ♀.

SOUTH AFRICA—TRANSVAAL: Pretoria, 2 ♂, 3 ♀ (*W. L. Distant*, 1911, 383); Pretoria, 1924, 1 ♀ (*H. H. Curson*).

SOUTH AFRICA—NATAL: Durban, 1902, 1 ♀ (*F. Muir*).

*Athalia himantopus*, Klug.

ABYSSINIA: Harrar, 2 ♂, ♀ (*G. Kristensen*, 1912–21).

KENYA: Aberdare Mountains, east foot and slopes of, 7000–8500 ft., 24–27. ii. 1911, 1 ♂ (*S. A. Neave*); Crater Lake, 9 miles north-west of Meru, 5700 ft., 15. ii. 1911, 1 ♂ (*S. A. Neave*); Mount Kenya, south-east slopes, 6000–7000 ft., 3–12. ii. 1911, 1 ♂, 3 ♀ (*S. A. Neave*).

UGANDA: South Toro, Mbarara, Fort Portal Road, 3800–4200 ft., 22–24. x. 1911, 1 ♀ (*S. A. Neave*).

NORTH RHODESIA: Chilanga, 1 ♂ (*R. C. Wood*, 1914, 354).

### Genus TRISODONTOPHYES, Enslin.

*Trisodontophyes robusta*, Forsius.

NYASALAND : Blantyre, about 3000 ft., 7–11. iv. 1910, 1 ♀ (*S. A. Neave*).

*Trisodontophyes nigroflava*, Enslin.

KENYA : Mount Elgon, south foot and slopes of, 5100–5800 ft., 8–13. vi. 1911, 1 ♂ (*S. A. Neave*); Upper Kuja Valley, South Kavirondo, 4200 ft., 5–8. v. 1911, 1 ♂ (*S. A. Neave*).

*Trisodontophyes angustata*, Enslin.

TANGANYIKA : Dar-es-Salaam, 11. v. 1918, 1 ♂ (*A. W. J. Pomeroy*).

## Tribe HOPLOCAMPINI, Enslin.

### Genus DULOPHANES, Konow.

*Dulophanes antennatus*, Enslin.

UGANDA : Lake Victoria, Nkosi Island, South Sesse, 25–27. v. 1928, 4 ♂ (*G. D. H. Carpenter*).

*Dulophanes abdominalis*, Enslin.

TANGANYIKA : 1 ♂ (*H. S. Stannus*, 1919, 414).

*Dulophanes morio*, Konow.

ABYSSINIA : Maraquo, viii. 1914, 1 ♀ (*O. Kovacs*).

*Dulophanes bensoni*, sp. n.

SOUTH AFRICA—NATAL : Van Reenen, Drakensberg, xii. 1926, 1 ♂ (*R. E. Turner*).

*Dulophanes natalensis*, sp. n.

SOUTH AFRICA—NATAL : Van Reenen, Drakensberg, xii. 1926, 5 ♂, 2 ♀ (*R. E. Turner*).

*Dulophanes obscurus*, sp. n.

SOUTH AFRICA—NATAL : Van Reenen, Drakensberg, xii. 1926, 1 ♀ (*R. E. Turner*); Umtata, Transkei, 12. ii.–18. iii. 1923, 1 ♂ (*R. E. Turner*).

### Genus ERIOCAMPOIDES, Konow.

*Eriocampoides limacina*, Retzius.

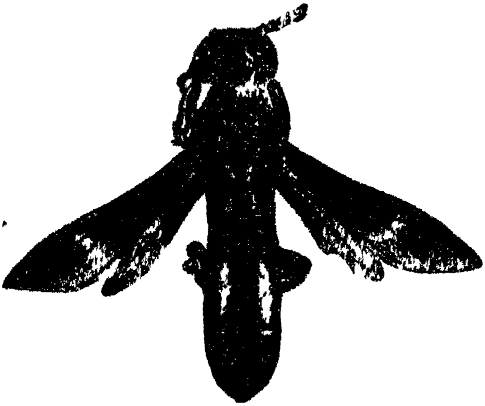
SOUTH AFRICA—CAPE PROVINCE : Ceres, xi. 1920, 1 ♀ (*R. E. Turner*).

## II.—Descriptions of a new Genus and new Species and Remarks on some little-known African Oryssoidea and Tenthredinoidea.

### Genus Chalinus, Konow. (Fig. 1.)

The described species of *Chalinus* are frankly too many, but the descriptions are too brief and insufficient to clear the synonymy without type-studies. The female of *Ch. haugi*, Buyss., is very like the female of *Ch. imperialis*, Westw., described by Enslin, but has a distinct hyaline stripe under the stigma in the front wings. This stripe seems to be narrower than in Westwood's figure of *Ch. plumicornis*, Guér.

Fig. 1.



*Chalinus haugi*, Buyss. Female

### Genus Arge, Schrank.

#### *Arge andromeda*, Kirby.

This species is probably a synonym of *A. tæniata*, Klug. In one male the last ventral plate is pale brown and not black, but I think that it may belong to this species. Probably *A. læta*, Buyss., also belongs here.

#### *Arge nigripes*, Klug.

In two males the abdominal tergites are marked with black in the middle.

### *Arge stuhlmanni*, Konow.

In some specimens (♂ and ♀) the abdominal tergites are more or less marked with black. *A. pallidiventris*, Ensl., is probably an extremely black variety of *A. stuhlmanni*, Kon., and my var. *maculigera* an intermediate form.

### *Arge petacacia*, Konow.

The intercostal cellule is in some specimens slightly infuscated, but that is probably a variable character.

### *Arge xanthomela*, Klug.

*A. congonensis*, Ensl., var. *katangana*, Forsius, is a synonym for this species.

### *Arge speciosa*, Klug.

*A. urania*, Kirby, is a synonym of *A. speciosa*, Klug. Konow says that the femora of these two species are differently coloured, but this is an error.

### *Arge incerta*, sp. n.

♀.—Head blue-black, only side-corners of clypeus and tips of mandibles pale brown; antennæ black; palpi piceous; hairs whitish. Thorax blue-black; side-parts of pronotum, tegulæ, sides of side-lobes of mesonotum, parapteron, and upper part of mesopleuræ yellowish; hairs whitish; legs, trochanters, and coxæ blue-black; wings inconsiderably pale brownish infuscated with slightly darker tips, but without distinct substigmatical shade; costa yellowish, subcosta toward stigma somewhat paler, but at base brown; stigma black, nervures more or less dark brown. Abdomen yellowish; first seven tergites in middle, and following segments wholly, blue-black; dark colour on first three tergites very small; hairs of abdomen pale.

Head very finely, rather sparsely and superficially punctured, finely and sparsely haired, very shining, behind eyes somewhat dilated; hind orbits a little shorter than eyes; vertex nearly twice as broad as long, somewhat convex, without middle furrow and with not very distinct postocellar and side-furrows; ocelli in a moderately low triangle, anterior ocellus in supraorbital line; interocellar furrow rather broad but not very deep, and ocellar basin distinct; POL:OOL about 2:3; frontal area rather narrow, near ocelli with indistinct side-crests, but downwards well limited by very high and nearly parallel lateral crests, which between antennæ become higher, but below antennæ again lower and converge, but do not meet on strongly convex supraclypeal area, which is not keeled; frontal fovea rather large, but not very deep; antennal furrows not very distinct; antennæ nearly as long as thorax, toward apex distinctly dilated and sharply three-edged; supraclypeal furrow wanting; clypeus not very convex, and in front in the middle roundly incised.

Thorax very finely and superficially punctured, and sparsely and rather shortly haired, very shining. In front wings discoidal nervure reaches subcosta immediately before origin of cubitus, and intercostal nervure is thus longer than space between discoidal and cubitus; third cubital cellule nearly as long as second; third transverse cubital nervure arcuated; areal nervure reaches discoidal cellule a little behind its middle. Metatarsus in hind legs a little longer than the three following joints together.

Abdomen finely transversely striated, impunctate, finely and shortly haired. Sheath rather long, seen from above nearly semicircular, conchiform, slightly depressed from below toward apex; at the base of the sheath two protuberances, and on under surface (near middle) a feeble semicircular depression with the convexity forwards.

Long. corp. 8 mm.; exp. alar. 18 mm.

♂ unknown.

1 ♀ (holotype), South Africa, Transvaal, Barberton (*P. Rendall*, Distant Collection, 1911, 383), in the British Museum.

Very nearly allied to *A. dirce*, Kirby, of which species I have only seen 1 ♀ from Kuisip, taken by J. Wahlberg and forwarded to the Riksmuseum in Stockholm. This specimen, determined in 1907 by Konow, is not in very good condition, but if Konow's identification is right, *A. incerta*, Forsius, can hardly be the same species. The costa is much paler in the new species, the stripe under the stigma is absent, and the side-lobes of the mesonotum on the sides and also the upper parts of the mesopleuræ are yellowish.

### *Arge mirabilis*, sp. n.

♀.—Head reddish and only the antennæ, and in the ocellar region a spot, which sends a stripe to the middle of the vertex, and two others over the antennæ, black. Pro- and mesothorax above reddish, below and whole of metathorax cyaneous; tegulæ reddish. Wings infuscated with dark bluish, tips being somewhat clearer; stigma and nervures black and only the radius somewhat reddish. Legs cyaneous. Abdomen and sheath also cyaneous.

Head much dilated behind eyes, very finely and rather sparsely punctured, and rather finely and sparsely haired, very shining; vertex slightly broader than long, rather convex, in middle divided by a fine but rather deep longitudinal furrow, which towards ocelli becomes deeper and broader; postocellar furrow not very distinct, but side-furrows deep; ocelli in a not very high triangle, anterior one in supraorbital line; POL : OOL nearly as 4 : 5; interocellar furrow not developed, but ocellar basin rather deep; antennal furrows rather deep and broad; antennal crests not very high nor very sharply edged, upwards diverging and becoming much lower, but reaching to lateral ocelli, downwards somewhat converging but not meeting; under surface in middle very convex, but not keeled; antennæ three-jointed, shorter than thorax, joint 1 about as broad as long, second very short, annuliform, third at base curved and towards apex gradually thickened; supraclypeal furrow wanting; clypeus about four times as broad as long, side-corners decised and front margin in middle slightly roundly excised; labrum flat, short, and with slightly emarginated front margin; malar space moderately long.

Thorax moderately convex, impunctate, and very sparsely furnished with pale hairs and very shining; scutellum not very convex; front margin broadly rounded; prescutellar furrow narrow, but rather deeply impressed. In front wings the space between the origin of cubitus and discoidal nervures is about as long as the intercostal nervure; transverse cubital nervures distinct and the third convex outwards; cubital cells becoming longer and broader towards apex of wings; first areal cross-vein reaches middle of discoidal cell; in hind wings humeral cell with a long appendiculation. Hind tibiæ longer than hind tarsi, and hind metatarsus about as long as the following three joints together; claws simple.

Abdomen very finely transversely striated, finely and sparsely haired, very shining; sheath very broad and rather long, conchiform, seen from behind nearly circular (as in *A. congonensis*, Ensl.), on under surface in the middle with a short keel, and at the sides depressed.

Long. corp. 12 mm.; exp. alar. 25 mm.

♂ unknown.

*Type-locality.*—1 ♀ (holotype), Nyasaland, Chiromo (*R. C. Wood*).

By the splendid colour without difficulty distinguished from all hitherto-known species.

### Genus TRIARGE, gen. nov.

Very like the genus *Arge*, Schr.

Body long, oval. Head only slightly narrower than thorax, behind eyes not dilated; clypeus in the middle emarginated; antennæ in ♀ moderately long, club-like, and distinctly tricarinated, in ♂ long, slender, and also tricarinated; ocelli in triangle, anterior one in the supraorbital line. In front wings radial cell is appendiculated and only three cubital cells present (second transverso-cubital nervure totally absent) and both recurrent nervures received by the great second cubital cell; discoidal and first recurrent nervure nearly parallel; discoidal nervure reaches subcosta before origin of cubitus; humeral cellule in the middle widely contracted and basal cellule very small; radial cellule in hind wings appendiculated; two closed middle cellules and humeral cellule with a long appendiculation. Hind tibiæ with a middle spur; claws simple. Sheath of the female forcipated.

Type of genus: *T. plumbea*, sp. n., South Africa, Cape Colony.

This new genus is very closely allied to *Arge*, Schr., but has only three cubital cellules in the front wings.

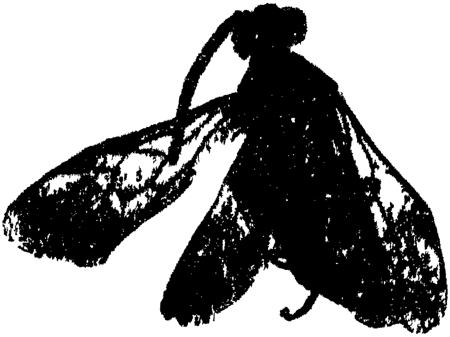
### *Triarge plumbea*, sp. n. (Fig. 2.)

Wholly metallic green-grey; antenna and legs partially without metallic shiftings and apical parts of femora and basal parts of tibiæ yellowish brown; other parts of tibiæ and tarsi piceous; wings inconsiderably infuscated with greyish or brownish, below the stigma a little darker; nervures and stigma piceous.

♀.—Head behind eyes nearly as broad as across eyes, without distinct punctures and moderately finely and sparsely greyish haired, very shining; vertex very short, about five times as broad as long, indistinctly limited; ocelli in a moderaterly high triangle; POL : OOL nearly 1 : 1; interocellar furrow and ocellar basin wanting; the sharply edged frontal carinæ diverge upward and reach anterior ocellus, but downwards they converge and meet below antennæ, and form a rather high carina which reaches to clypeus; antennæ only slightly and gradually dilatated towards apex, and little shorter than thorax; clypeus slightly convex, without distinct supraclypeal furrow, about four times as long as broad, with obliquely decised side-corners and in middle with slightly emarginated front margin; labrum broad, flat, and with truncated front margin; malar space rather narrow.

Thorax impunctate and with rather short and sparse grey hairs, very shining; scutellum slightly convex, nearly triangular, with only slightly convex front margin; prescutellar furrow rather deep. Hind tibiæ nearly as long as hind tarsi; hind metatarsus not fully as long as three following joints together; space between end of discoidal nervure and origin of cubitus longer than intercostal nervure; second cubital cellule about as long as third; last transverse cubital nervure curved outwards; first areal cross-vein reaches middle of discoidal cellule.

Fig. 2.



*Triarge plumbea*, gen. et sp. n. Male (allotype).

Abdomen moderately long, oval, very finely sculptured, very sparsely and finely haired, shining; sheath basally broad, seen from above towards the apex cleft and slightly curved like forceps; the branches of the sheath on their inner margins with rather dense and long hairs; sheath seen from side, toward apex rather acuminate.

♂.—Slender, a little narrower behind the eyes; antennæ long and slender, about as long as head and thorax together. Last ventral plate not very long, somewhat convex, and slightly angulately emarginated posteriorly.

Long. corp., ♀ 6–6·5 mm., ♂ 6–7 mm; exp. alar. 11·5–13 mm.

*Type-locality.*—1 ♀ (holotype) and 1 ♂ (allotype), South Africa, Cape Province, Ceres, 1–12. xi. 1924 (*R. E. Turner*); 1 ♀ (paratype) and 1 ♂ (paratype), South Africa, Cape Province, Mossel Bay, v. & viii. 1921 (*R. E. Turner*).

Reminds one somewhat of our *Arge ciliaris*, Klug.

## Genus ATHALIA, Leach.

This genus is proportionately rich in species and frankly the most difficult of the African genera of Tenthredinoidea, the differences between some species being very slight. A revision of this genus is very desirable but very difficult without comparison of the type-specimens, and these are scattered about in different museums.

### *Athalia turneri*, sp. n.

♀.—Head black; supraclypeal area, lower parts of orbits pale yellow; clypeus, labrum, and base of mandibles whitish; palpi dirty white and tips of mandibles dark brown; antennæ piceous, below somewhat paler, two first joints yellowish and only slightly piceous above; hairs of head above short, thinner, and yellowish, below longer, somewhat denser, and more whitish. Thorax yellowish, above with reddish shiftings; middle lobe of mesonotum nearly wholly dark and only at the sides narrowly pale; hind corner narrowly margined with black; a black macula above and behind the base of the wings, a spot beside scutellum and most of metanotum black; postscutellum and appendix of the scutellum reddish yellow. Wings hyaline, the apices not distinctly darker; stigma and nervures black and only basal part of costa and subcosta yellow; intercostal cellules not infuscated. Legs yellow, and only apical parts of hind tibiæ and hind tarsal joints infuscated; on fore legs only the apical tarsal joints at the tips infuscated. Abdomen yellow; the first tergite (propodeum) basally slightly black and apex of sheath black.

Head nearly as broad as thorax, behind the eyes roundly narrowed, very finely punctate and with rather sparse and fine hairs, very shining; vertex slightly convex, laterally very indistinctly limited; postocellar furrow distinct, but not very deep; ocelli in a low triangle, posterior ones just below supraorbital line; interocellar furrow rather deep and broad; ocellar basin distinct; frontal area rather flat and side-crests low; median fovea broadly connected with frontal area; below anterior ocellus a rather deep round impression; antennal furrows not very deep; antennæ ten-jointed (two last joints, however, indistinctly separated), somewhat club-like; two first joints with long erect hairs; following joints finely and shortly haired; first joint as long as broad and a little longer and slightly broader than second, which is as long as broad; third joint about as long as two following joints together; fourth joint a little longer than broad; fifth as long as broad; following joints broader than long, the eighth being the broadest; last joint nearly conic, but with blunt apex; eyes short, oval, converging towards clypeus; supraclypeal furrow distinct; clypeus rather short, with convex front margin, and about four times as broad as long in the middle; labrum rather long, somewhat convex and with broadly rounded front margin; malar space nearly as long as second joint of antennæ.

Thorax moderately convex, with very fine and sparse punctures, finely and sparsely haired, very shining. Stigma in front wings basally very broad, but apically acuminated; radial cross-vein begins in apical part of stigma and reaches third cubital cell just before the middle; first recurrent nervure reaches discoidal cellule between one-fifth and two-fifths from its base.

Abdomen short, oval, impunctate, very shortly and sparsely haired and very shining; sheath, seen from above, very short.

♂ unknown.

Long. corp. 6·5 mm.; exp. alar. 16 mm.

*Type-locality.*—1 ♀ (holotype), South-west Africa, Okahandja, 10–16. ii. 1928 (*R. E. Turner*), and named in honour of this eminent collector.

Near *A. malagassa*, Sauss., but differs among other things in the colour of the thorax.

### *Athalia zanzibarica*, sp. n.

♂.—Head black; first two joints of antennæ and under surface of the other joints yellow; supraclypeal area near the clypeus, clypeus, labrum, palpi, basis of mandibles, and malar space pale yellow. Thorax yellow; medial part of pronotum and mesonotum black, with reddish inner margins of the lateral lobes. Wings yellowish and towards apices somewhat greyish; costa and subcosta black, with yellowish base; intercostal cellules not infuscated; nervures at bases of wings yellowish, but at apices fuscous. Legs yellow; apices of tibæ and tarsal joints infuscated (in fore legs only slightly greyish). Abdomen yellow.

Head rather short, about as broad as thorax, behind the eyes strongly and roundly narrowed, very finely and superficially punctured, and rather sparsely furnished with brownish recumbent hairs, very shining; vertex rather flat, indistinctly limited laterally, and with no postocellar furrow; ocelli in a low triangle below supraorbital line; interocellar furrow broad but not very deep, and ocellar basin distinct:

eyes short, oval, converging towards clypeus; antennal furrows indistinct; frontal area flat, laterally indistinctly limited, and with no frontal crest; median fovea large but superficial; antennæ nearly as long as thorax and head together, twelve-jointed, towards apex gradually dilated, eleventh joint being the broadest; antennæ very shortly and finely and rather densely haired; first joint a little longer and broader than second; third joint about one-and-a-half times as long as second and nearly as long as the two following joints together; seventh as long as broad; following joints a little broader than long, but last joint a little longer than broad at the base, and with rather blunt apex; supraclypeal furrow not very deep; clypeus with strongly convex front margin, nearly three times as broad as long in the middle; labrum not very long, with broad apex; malar space rather short.

Thorax moderately convex, very finely and sparsely punctate, finely and sparsely haired, very shining. Stigma in front wings at apex obliquely decised; radial cross-vein begins near apex and reaches third cubital cellule a little after its middle; first recurrent nervure reaches discoidal cellule between one- and two-fifths from the base of cell.

Abdomen rather short-oval, very shining, impunctate, finely and sparsely haired; last ventral plate posteriorly nearly decised.

Long. corp. 6 mm.; exp. alar. 14 mm.

♀ unknown.

*Type-locality.*—1 ♂ (holotype), Zanzibar, Pemba Island, 15–23. ix. 1924 (*H. J. Snell*).

Near *A. malagassa*, Sauss., and *A. pullicoma*, Kon., but otherwise coloured. Cannot be the unknown male of *A. turneri*, Forsius, because the antennæ are very differently coloured.

### *Athalia dissona*, Konow.

*A. schoutedeni*, Forsius, is without doubt a form of *A. dissona*, Kon., with black costa and subcosta. I think that also *A. concors*, Kon., and *A. mashonensis*, Ensl., are only varieties of the same species.

### *Athalia abyssinica*, Forsius.

This species is described in 'Notulæ Entomologicæ,' 1930, part iii. I possess the holotype from Abyssinia, Harrar (leg. *Kristensen*). The ♀ (paratype) in the British Museum was also collected in Abyssinia, Harrar (Coll. R. E. Turner), and was sent to Mr. Turner by the same collector.

### *Athalia clavata*, Konow.

The differences between *A. clavata*, Kon., and *A. furvipennis*, Kon., are very slight, and probably they are only varieties of the same species.

### *Athalia fumosa*, Gribodo.

The clypeus is very short, but the front margin is not absolutely straight, but slightly convex. The form of the front margin of the clypeus is otherwise not absolutely constant in this genus.

### *Athalia truncata*, Ensl. (*bicolor*, Sauss., nec Lap.).

This species is very closely allied to *A. himantopus*, Klug. The specimens from Distant's collection are probably types or paratypes of this species. Konow states that this species has the pronotum yellow and rounded clypeus, but this is obviously an error. The differences between *A. truncata*, Ensl., and *A. himantopus*, Klug, are very inconsiderable; then the colour of the wings is no doubt very variable, and the dark apical parts of the wings of *A. truncata*, Ensl., turn pale in old specimens.

### *Athalia vollenhoveni*, Gribodo.

This species is also very closely allied to *A. sjoestedti*, Kon., and the wings of the last-mentioned species are often very slightly infuscated, especially in old collections. Careful studies of the Saws in this genus are very desirable. My own collection of African *Athalia* is unfortunately too small.

## Genus XENAPATES, Kirby.

### *Xenapates offrenatus*, Konow.

The wings are, in my opinion, fuscous to the basal nervure, and not only to the first recurrent nervure as Konow and Enslin say. The wings are otherwise only slightly infuscated.

### *Xenapates pallidiventris*, Forsius.

In my description of *Distega pallidiventris*, Forsius, I have mentioned that the base of the humerus is distinct but does not reach the brachium. This is, as I now find, a variable character, and it is therefore better to remove this species to the genus *Xenapates*, Kirby. The base of the humerus is also distinct in some other species described as belonging to *Distega*, Kon., and several African species of Blennocampini are much more slender than the Palæarctic species, and constitute, I think, a transition to the Selandriini.

### Genus Neacidiophora, Enslin.

#### *Neacidiophora bequaerti*, Enslin, var. *sternalis*, nov.

The black colour of this species is somewhat variable. The mesosternum is in some specimens black, and this black colour is sometimes extended to the lower parts of the mesopleuræ, but I have, at least hitherto, not seen specimens with totally black pleuræ. The scutellum is also sometimes clear yellowish, sometimes more or less black.

*Type-locality.*—1 ♂ (holotype), Abyssinia, Maraquo, 7. v. 1914 (*O. Kovacs*); 1 ♂ (paratype), South Africa, Natal, Durban, 1902 (*F. Muir*); 1 ♂ (paratype), Kenya, 12 miles north-east from Meru, Kenya, 4500 ft., 3. v. 1911; 1 ♂ (paratype), Uganda, near Kampala, on Kampala–Jinja Road, 4000 ft., vii. 1911 (*S. A. Neave*). I have also seen 1 ♂ (paratype), Ghinda (*K. M. Levander*), in the University Museum at Helsingfors.

#### *Neacidiophora athaloides*, Konow.

The ♀ of this spécies was hitherto unknown, but is coloured as in the ♂. The sheath, as seen from above, is basally rather broad, but towards apex is gradually acuminated and furnished with rather long erect hairs.

#### *Neacidiophora athaloides*, Konow, var. *obscura*, nov.

1 ♀ in the B.M. is much darker coloured. The pro- and mesothorax are wholly black, and also the tegulæ and scutellum.

*Type-locality.*—1 ♀ (holotype), Kenya, Masai Reserve, Lake Naivasha, 20. xii. 1913, about 6000 ft. (*A. O. Luckman*).

#### *Neacidiophora bellicornis*, Konow.

The dark spots on the front and on the lobes of mesonotum are often very inconsiderable and sometimes wanting.

### Tribe Blennocampini, Enslin.

### Genus Distega, Konow.

Compare the remarks upon *Xanapates pallidiventris*, Forsius.

### *Distega abdominalis*, sp. n.

♂.—Head and antennæ black. Thorax black. Wings with slight greyish infuscation; stigma and nervures black. Legs fulvous; coxæ, trochanters, and base of femora black; tarsi with slight greyish infuscation. Abdomen fulvous; sutures of propodeum and last ventral plate blackish.

Head very much narrowed behind eyes, without distinct punctures, very finely and sparsely haired, very shining; posterior orbits rounded, not distinctly carinated posteriorly; vertex rather convex, a little broader than long, well limited by deep lateral and postocellar furrows, and with a distinct middle furrow; ocelli in a nearly equilateral triangle; lateral ocelli just above supraorbital line; POL : OOL about as 2 : 5; interocellar furrow rather broad and ocellar basin deep; frontal area small, side-crests distinct but blunt; frontal crest in middle impressed and median fovea thus communicating with frontal area; antennal furrows rather deep and rather strongly curved; antennæ rather slender, moderately densely haired, nearly as long as head and thorax together, nine-jointed; first joint a little longer but not broader than the second, which is a little longer than broad; third joint about one-and-a-quarter times as long as fourth; the following joints by degrees shorter; penultimate joint a little longer than broad; space between antennæ a little longer than space between antennæ and eyes; between the antennæ a small rounded knob; face below antennæ very short; supraclypeal furrow distinct; clypeus about three times as broad as long, very slightly convex; front margin is straight and side-corners obliquely decised; labrum depressed; malar space wanting.

Thorax not very convex, very finely and sparsely punctate and finely and sparsely haired, very shining. Discoidal nervure in front wings parallel with first recurrent nervure, and reaches subcosta at origin of cubitus; first cubital cross-vein well developed; second cubital cellule longer than first and third; third cubital cellule nearly as broad as long and with somewhat acuminated hind lateral corner; stigma long and oval; first areal cross-vein reaches discoidal cellule just before middle of cellule; base of humerus distinct but short; two closed cells in hind wings and humeral cellule shortly appendiculated. Legs rather long and slender; hind tarsi only slightly shorter than hind tibiæ and hind metatarsi nearly as long as following joints together; claws with a great nearly parallel inner tooth.

Abdomen impunctate, very shining, rather long, oval; blotch rather large; last ventral plate rather convex, posteriorly in the middle slightly emarginated, nearly straight.

Long. corp. 5·5 mm.; exp. alar. 12 mm.

♀ unknown.

*Type-locality.*—1 ♂ (holotype), Uganda, Mount Kokanjero, south west of Elgon, 6400 ft., 7–9. viii. 1911 (*S. A. Neave*).

Distinguished from all other hitherto-known males of *Distega* by the colour of the abdomen.

### Genus Blennocampa, Hartig.

*Blennocampa bensoni*, sp. n.

♀.—Head and antennæ black; only tips of mandibles brownish. Thorax black; the angles of pronotum, tegulæ, side-lobes of mesonotum, and most of mesopleuræ reddish yellow. Wings with a greyish infuscation; stigma and nervures black and only the upper basis of costa and subcosta yellowish. Coxæ, trochanters, and femora black; front femora, however, piceous on the apex; tibiæ pale luteous, with the tips narrowly infuscated; apices of the tarsal joints a little infuscated. Abdomen black.

Head behind eyes distinctly narrowed, not carinated, distinctly but finely and rather sparsely punctate, rather sparsely and finely haired, very shining; vertex somewhat convex, nearly twice as broad as long, in front and laterally distinctly margined, and in front in the middle slightly longitudinally impressed, but without distinct middle furrow posteriorly; ocelli in a rather low triangle; lateral ones just below supraorbital line; POL : OOL nearly as 1 : 1; interocellar furrow distinct but not very broad; ocellar basin deep and rather broad; supra-antennal grooves rather large and elongated; frontal area rather flat; side-crests low; above the antennæ a sharply edged frontal crest, which is conjuncted with the moderately high but narrow and sharply edged interantennal crest; eyes rather short, oval, with their inner margins somewhat converging towards clypeus; antennæ nine-jointed, about as long as head and thorax together, rather slender and nearly filiform; second joint nearly as long and broad as first; third one-and-a-half times as long as fourth; the following joints by degrees shorter; last joints nearly twice as long as broad; face below antennæ very short, depressed; supraclypeal furrow very distinct; clypeus slightly convex, about four times as broad as long, claws cleft and also furnished with a short tooth-like corner, but not, as in the genus *Trisodontophyes*, with three distinct teeth.

Abdomen moderately long, oval, impunctate, sparsely and finely haired, very shining; blotch rather broad; sheath seen from above at base rather narrow, and towards apex somewhat narrowed but not acuminated, seen from side rather narrowly rounded toward apex, not very exserted, and with rather sparse and not very long hairs.

Long. corp. 6·5–7·5 mm.; exp. alar. 12·5–15 mm.

♂ unknown.

*Type-locality.*—2 ♀ (holotype and paratype), South Africa, Umtata, Transkei, 18.ii.–18.iii.1923 (*R. E. Turner*).

Close to the preceding species, but differs in the colour and the sculpture of the head.

### *Blennocampa sudanica*, sp. n.

♀.—Head black; medial parts of first and apical parts of first and second joints of the antennæ yellowish; clypeus, with exception of the middle, and apices of mandibles brown; labrum and palpi yellowish. Thorax black; middle of pronotum, mesonotum, lower and upper parts of mesopleuræ, and middle of parapteron pale yellow; metapleuræ and middle of the postscutellum yellowish. Legs pale yellow; tips of the tibiæ and tarsal joints annulated with black, in front legs, however, not very distinctly so. Wings with slightly yellowish tinge, but at apex with distinct greyish infuscation; costa and stigma black; other nervures at base of wings yellowish and towards apex piceous. Abdomen yellowish, and only tip of sheath black.

Head very finely and indistinctly punctate above, below more distinctly punctate, sparsely and shortly haired, very shining, behind eyes distinctly roundly narrowed, posteriorly not carinated; vertex somewhat convex, about twice as broad as long, with broad lateral furrows which are curved inwards and somewhat converging towards ocelli; postocellar furrow rather superficial; ocelli in a rather low triangle; posterior ones in supraorbital line; POL : OOL about as 3 : 4; interocellar furrow and ocellar basin distinct but not very deep; frontal area flat and very slightly elevated, indistinctly limited and in front in middle deeply excavated, and in middle impressed; antennal furrows not developed; above antennæ with distinct crests; frontal fovea not distinctly developed, but space between and above antennæ somewhat impressed;

antennæ about as long as thorax, nine-jointed, before apex only slightly thickened; first joint about twice as long as broad and a little longer than second, which is twice as long as broad; third joint nearly twice as long as fourth; fourth joint as long as fifth; the following joints shorter, but all joints longer than broad; last joint nearly twice as long as basally broad; clypeus distinctly outstanding, somewhat convex, about twice as broad as long, with nearly straight front margin and nearly rectangular side-corners; labrum moderately short, with broadly rounded front margin; malar space linear.

Thorax rather convex, finely and shortly haired, impunctate, shining; presternum of metapleuræ not developed. In the front wings discoidal nervure parallel with first recurrent nervure; four distinct cubital cellules, second nearly as long as third, third with hind lateral corner acuminated; first areal nervure reaching discoidal cellule between its second and last thirds; base of humerus distinct, but short; radial cross-vein not interstitial with third transverse-cubital nervure, but reaches third cellule in its lateral third; humeral cellule in hind wings with a short appendiculation; no closed medial cells. Claws cleft.

Abdomen rather short-oval, without punctures, very finely and shortly haired, shining; sheath seen from above basally rather narrow and towards apex gradually narrowed, rather shortly haired.

Long. corp. 7 mm.; exp. alar. 16 mm.

♂ unknown.

*Type-locality.*—1 ♀ (holotype), South-east Sudan, Didinga District, Nagichot, 6700 ft., xii. 1925–i. 1926 (*G. D. H. Carpenter*).

Probably most nearly allied to *B. affinis*, Fall., from the Palæarctic Region.

### Genus TRISODONTOPHYES, Enslin.

#### *Trisodontophyes robusta*, Forsius.

I have before me the type of *T. afra*, Kon., from the Riksmuseum in Stockholm, and find that I earlier erroneously determined this new species as *T. afra*, Kon. The head in the new species is dilated behind the eyes, and is described in 'Notulæ Entomologicæ,' 1930, part iii. The specimen in the British Museum, Nyasaland, Blantyre, 7–11. iv. 1910, about 3000 ft. (*S. A. Neave*), is a paratype of *T. robusta*, Fors.

## Tribe HOPLOCAMPINI, Enslin.

### Genus DULOPHANES, Konow.

### *Dulophanes antennatus*, Enslin.

The male of this species was hitherto unknown, and is coloured as in the female.

4 ♂ (one of them the allotype), Uganda, Lake Victoria, Nkosi Island, S. Sesse, 25–27.v.1928 (*G. D. H. Carpenter*).

### *Dulophanes morio*, Konow.

Only males are hitherto known. The female is coloured nearly as in the male. The sheath is very short, rather broad, and posteriorly truncated seen from above. The antennæ are 12-jointed and in the middle a little more thickened than in the male. The front tibiæ and the inner parts of the front femora are brownish, and these parts in the hind legs not quite black but piceous.

The allotype was collected in Abyssinia, Maraquo, viii.1914 (*O. Kovacs*).

### *Dulophanes bensoni*, sp. n.

♂.—Head and antennæ black. Thorax black; legs pale yellow, and only the front coxæ basally and the last tarsal joints on hind legs slightly infuscated. Wings with a slight greyish infuscation. Abdomen black.

Head behind eyes strongly narrowed, without distinct punctures, finely and sparsely haired, very shining, posterior orbits narrow, posteriorly somewhat sharpened, but not distinctly carinated; vertex slightly convex, about three times as broad as long, in middle in front impressed, but without distinct middle furrow; side-furrows rather deep and in front rather strongly curved; postocellar furrow wanting; eyes large, their inner margins somewhat convergent; ocelli in a low triangle below supraorbital line; interocellar furrow distinct, but ocellar basin very shallow; POL : OOL about 1 : 1; frontal area nearly circular, flat, laterally and below distinctly limited by narrow and low crests; antennal furrows indistinct; supra-antennal grooves deep and large, and about as deep and well limited as frontal fovea; antennæ inserted low down, about as long as the thorax, eleven-jointed, nearly filiform; first joint a little longer than broad and about as long and broad as second joint; third joint about one-and-a-half times as long as third; all joints distinctly longer than broad and furnished with rather dense hairs, which are a little longer than half the breadth of joints; face below antennæ short and depressed; supraclypeal furrow distinct; clypeus a little outstanding, rather flat, about four times as broad as long, side-corners blunt and front margin nearly straight; malar space linear.

Thorax impunctate, sparsely and shortly haired, very shining; presterna not separated. Hind tibiæ a little longer than hind tarsi, and hind metatarsus only little shorter than following joints together; claws simple. In front wings first transverse-cubital vein distinct; third cubital cellule much longer than second and distinctly dilated towards apex of wings, and in its middle receiving transverse-radial nervure; hind lateral corner of third cubital cellule nearly rectangular; discoidal and first recurrent nervures slightly converging; discoidal nervure about twice as long as space between discoidal nervure and cubitus; cubitus near the base bent at nearly a right angle; areal nervure reaches discoidal cellule a little outwards of middle; no closed medial cells in hind wings.

Abdomen rather long, oval, impunctate, very finely and sparsely haired, very shining; last ventral plate moderately short and not very convex, posteriorly straightly decised.

Long. corp. 6 mm.; exp. alar. 12 mm.

♀ unknown.

*Type-locality.*—1 ♂ (holotype), South Africa, Natal, Van Reenen, Drakensberg, xii. 1926 (*R. E. Turner*).

Coloured much as in *D. flavipes*, Ensl., but the legs much paler and the antennæ wholly dark.

Named in honour of Mr. Robert B. Benson, of the British Museum.

### *Dulophanes natalensis*, sp. n.

♂ ♀.—Head and antennæ black; only tips of mandibles brownish. Thorax black. Wings with somewhat greyish infuscation, substigmatical region inconsiderably more infuscated, and apical part of fore wings little more hyaline; stigma and nervures black. Coxæ and trochanters black; femora black, with testaceous tips; tibiæ and tarsi testaceous, with tips apically slightly greyish; last three joints of tarsi with slight greyish infuscation (in hind wings very inconsiderable). Abdomen black; in some specimens plates in middle somewhat brownish.

Head hardly narrower than thorax, behind eyes strongly narrowed, seen from above twice as broad as long, finely and sparsely haired, finely sculpturated and punctate, shiny; vertex moderately convex, nearly four times as broad as long, in middle shallowly furrowed; postocellar furrow shallow, side-furrows distinct but not very deep; eyes large, oval, converging downwards; ocelli in a very low triangle, much below supraorbital line; POL : OOL about 1 : 1; interocellar furrow distinct but rather shallow and ocellar basin indistinct; frontal area not distinctly limited, and antennal furrows absent; antennæ about as long as thorax, ten-jointed, but last joint only indistinctly separated; first joint about as long as second; third joint nearly twice as long as the fourth; the following about as long as broad; antennæ rather densely covered by short suberect hairs; middle fovea rather large and deep and about as large as supra-antennal grooves, and situated a very little lower than these; clypeus a little outstanding, only slightly convex, about three times as broad as long, with rounded side-corners and nearly straight front margin; supraclypeal furrow distinct; labrum short; malar space linear.

Thorax moderately convex, very finely and sparsely haired and finely and superficially punctated, very shiny; lateral furrows of the mesonotum deep and posterior angle of middle lobes rather obtuse; scutellum flat and front angle pointed. First cubital cross-vein distinct, but in middle paler; second cubital cellule three times as long as first and a little longer than third; areal nervure reaches discoidal cellule between second and last thirds; discoidal nervure reaches subcosta long before origin of cubitus (this distance is longer than first cubital cross-vein); first recurrent nervure reaches second cubital cellule before its second third; humeral cellules in both wings appendiculated. Hind tibiæ distinctly longer than hind tarsi, and hind basitarsi shorter than following joints together; claws with a suberect inner tooth.

Abdomen shining, and finely and sparsely haired and punctated; sheath very short.

Long. corp. 4–5 mm.; exp. alar. 10–11 mm.

*Type-locality.*—5 ♂ (allotype and paratypes) and 2 ♀ (holotype and paratype), South Africa, Natal, Van Reenen, Drakensberg, xii. 1926 (*R. E. Turner*).

Very near *D. flavipes*, Ensl., but the distance between the end of the discoidus and origin of the cubitus is longer, the antennæ shorter and more robust, and only ten-jointed, and only the apex of the hind femora pale. The claws are furnished with a suberect inner tooth and are not cleft. I have seen some specimens of *D. flavipes*, Ensl., from Belgian Congo.

*Dulophanes obscurus*, sp. n.

♀.—Black and furnished with dark hairs; only fore tibiæ, tarsi, and apex of front femora brownish. Wings rather intensely infuscated with blackish.

Head behind eyes about as broad as across eyes, impunctate, finely and sparsely haired, very shining; posterior orbits strongly rounded; vertex about twice as long as broad, somewhat convex; lateral furrows rather deep and converging forwards; postocellar furrow not developed; ocelli in a rather low triangle; posterior ones just below supraorbital line; interocellar furrow indistinct, ocellar basin not very deep; POL : OOL about as 3 : 4; frontal area rather broad, distinctly limited by rather sharply edged lateral crests, in middle slightly swollen from anterior ocellus to the not very high frontal crest, which laterally has a slight incision; median fovea broad but not very deep; antennæ eleven-jointed, inconsiderably shorter than thorax, rather filiform and in middle only slightly thickened; first joint a little longer and broader than second, which is about as long as broad; third joint nearly as long as two following joints together; fourth nearly one-and-a-half times as long as fifth, the following by degrees shorter, but all joints distinctly longer than broad; antennæ rather densely covered with short recumbent hairs; clypeus not very convex, about three times as broad as long, with obliquely decised side-corners and practically straight front margin, and in middle with a low longitudinal crest; supraclypeal furrow distinct and sensorial foveæ rather large; malar space linear.

Thorax broad, not punctate, sparsely and shortly haired, very shining; medial furrow of mesonotum rather deep and medial lobes in front very convex. Discoidal and first recurrent nervures not very converging, and first-mentioned nervure reaching subcosta long before origin of cubitus, and space between these nervures nearly as long as discoidal nervure; first transverse-cubital indistinct; third cubital cellule about as long as second and outwards much broadened and with hind lateral corner very acuminated; first areal nervure reaches discoidal cellule nearly between second and last third; two closed middle cellules in hind wings. Hind tarsi only two-thirds of hind tibiæ, and hind metatarsi only slightly longer than the three following joints together; claws simple.

Abdomen broadly rounded, impunctate, very shining. Sheath very short.

♂.—Coloured as in ♀. Last antennal joints are as long as broad. Transverse-radial nervure interstitial with third transverse-cubital nervure, and running in the same direction. (This male specimen is gummed on card, and is not in a very good condition, but presumably belongs to this species.)

Long. corp., ♀ 5·5, ♂ 4·5 mm.; exp. alar., ♀ 12·5, ♂ 10·5 mm.

*Type-locality.*—1 ♀ (holotype), South Africa, Natal, Van Reenen, Drakensberg, xii. 1926 (*R. E. Turner*); and 1 ♂ (allotype), South Africa, Umtata, Transkei, 12. ii.–18. iii. 1923 (*R. E. Turner*).

This species is very like *D. morio*, Kon., but the antennæ are much shorter and less slender.

### Genus Eriocampoides, Konow.

#### *Eriocampoides limacina*, Retzius.

This species has no doubt been imported into Africa with fruit-trees.

## II.—*African* Lasiocampidæ: *a Correction, and the Description of a new Species of* Pachypasa. By W. H. T. Tams.

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[Plate I.]

In Seitz, 'Macrolepidoptera of the World,' vol. xiv., Aurivillius states that *Pachypasa chærocampoides*, Holland = *P. lineata*, Auriv., and that the male of *P. lineata* is easily recognizable by the figure (pl. 33, *d*). If this figure is even moderately accurate, a comparison with the photographic figure of *P. chærocampoides* given in this paper (Pl. I. fig. 3) will render evident the fact that two entirely different species are represented. The specimen photographed is one presented to the British Museum by Dr. W. J. Holland, and actually compared with type and labelled in my presence during my visit to the Carnegie Museum at Pittsburgh, Pa., in 1928.

The new species, which is described below, bears some resemblance to the figure of *P. lineata*, but several points in the figure and in the description satisfy me that *P. lineata* is a species with which I have not yet met.

#### *Pachypasa papyri*, sp. n. (Pl. I. figs. 1, 2.)

♂.—Palpus ochraceous orange with a sparse admixture of brick-red. Antenna honey-yellow. Head with frons ochraceous orange, vertex cartridge-buff mixed with brick-red, appearing *greyish*. Thorax brick-red mixed with cartridge-buff (appearing *greyish*), with a narrow maroon, medial, longitudinal stripe. Tergum brick-red mixed with ochraceous orange, the brick-red predominating in proximal half, the ochraceous orange predominating in distal half. Pectus ochraceous orange mixed with brick-red. Legs brick-red sparsely streaked with ochraceous orange, the tarsi with the segments ringed distally with ochraceous orange. Venter ochraceous orange streaked with brick-red. Fore wing brick-red finely irrorated with cartridge-buff; antemedial fascia hardly traceable, fuscous; a postmedial fascia of two almost contiguous narrow fuscous fasciæ parallel with termen to vein *Cu* 2, then converging towards and ending in prominent black scaling at tornus; fringe faintly streaked with ochraceous buff. Hind wing brick-red, richly so coloured proximally owing to the thick clothing of hair-scales, semi-translucent towards the termen, where the scaling is very thin. Underside similar, but without irroration on fore wing, resulting in a smoother effect. Expanse 52 mm.

♀.—Similar, with the general coloration toned down to vinaceous russet; antemedial fascia on fore wing as prominent as postmedial, accentuated by a preceding strip of cartridge-buff irroration; postmedial fascia with the two component fuscous fasciæ more diffuse than in the male, the separating strip of ground-colour irrorated with cartridge-buff; a strip of faint fuscous irroration before the termen. Hind wing vinaceous russet, lightly suffused with fuscous over distal half. Underside vinaceous russet, the fore wing with some long ochraceous-orange hair-scales in the cell, and both wings sparsely irrorated with cartridge-buff along costa. Expanse 92 mm.

Holotype ♂: Uganda, Kampala, 4. viii. 1930 (*G. L. R. Hancock*).

Allotype ♀: Uganda, Kampala, 12. viii. 1930 (*G. L. R. Hancock*).

Paratypes: 4 from the same source, dated 6. viii. 1930 (2 ♂♂, 1 ♀), 14. viii. 1930 (1 ♀).

All bred from larvæ feeding on *Papyrus*.

The specimens have been presented to the British Museum by the Director of the Imperial Institute of Entomology.

## EXPLANATION OF PLATE I.

*Fig.* 1. *Pachypasa papyri*, Tams, sp. n., ♂.
*Fig.* 2. Ditto, ♀.
*Fig.* 3. *Pachypasa chœrocampoides*, Holland, ♂.

## III.—*Bees of the Genus* Megachile *from Africa.*

By T. D. A. Cockerell.

The bees recorded below were received through Sir Guy Marshall, Imperial Institute of Entomology, and now become the property of the British Museum.

### *Megachile tarsisignata*, Cockerell.

♂.—Transvaal: S.W. Waterberg Dist., Jan. 31, 1928 (*Prof. J. C. Faure*).

### *Megachile eurymera*, Smith (*flava*, Friese).

♂.—Entebbe, Uganda, 1919 (*C. C. Gowdey*, 3103).

Compared with a male from Nyasaland, Domira Bay, W. shore Lake Nyasa (*S. A. Neave*), it differs by the anterior basitarsi not being black right across, and by the narrower and not distinctly denticulate apical lobe of sixth tergite. This wide-ranging species probably presents several local races, but the material is not sufficient for their elucidation. The hind tarsi readily distinguish this species from *M. tarsisignata.*

The reference of *M. flava* to *M. eurymera* was made in the British Museum collection, presumably by Meade-Waldo. I accept it as applied to the species in a broad sense. *M. brochidens*, Vachal, is very similar. I found a female *M. brochidens*, about 14 mm. long, in the Paris Museum, but unfortunately it was in bad condition. I have, however, seen a good one (now in the Congo Museum) from the Belgian Congo.

### *Megachile bevisi*, Cockerell.

♂.—Transvaal: S.W. Waterberg Dist., Jan. 31, 1928 (*Prof. J. C. Faure*).

*M. melliferina*, Ckll., is very similar, but has much broader hind basitarsi.

### *Megachile lutescens*, Cockerell.

♂.—S. Nigeria: Ilaro, with nest of leaves, as usual in genus, April 14, 1920 (no collector cited, but no. 472).

*M. lutescens*, originally described from Lubutu, Belgian Congo, resembles *M. flavescens*, Friese, in the keel of sixth tergite and other characters, but the legs are distinctive. It is very near to *M. flavibasis*, Ckll., but readily separated by the black instead of light red outstanding hairs of fifth tergite. Length about 9 mm.

### *Megachile stellarum*, Cockerell.

♀.—Natal: Weenen, 2840 ft., in thorn country, Nov. and Dec. (*H. P. Thomasset*).

### *Megachile gathela*, Cameron.

♀.—Sudan: Kodroko, Feb. 9, 1910 (*H. H. King*).

An Asiatic species, extending to N.E. Africa.

### *Megachile variscopula*, sp. n.

♀.—Length 7 mm.

Black, hoary, with white pubescence, fulvous on vertex, and very faintly yellowish on dorsum of thorax, with no admixture of black or fuscous; hair at sides of face very dense and pure white; cheeks densely covered with white hair; mesothorax appearing grey from the thin covering of hair. Legs with white hair, pale fulvous, not strongly coloured on inner side of tarsi; tergites with entire well-defined hair-bands, on first weak in middle; ventral scopa pure white, but clear ferruginous on penultimate sternite and black on last; eyes grey; mandibles short and broad, quadridentate, with a conspicuous red subapical band; clypeus densely punctured, with an impunctate median ridge, lower margin obtusely angulate on each side of middle; flagellum faintly brownish beneath; mesothorax and scutellum dull, extremely densely punctured; tegulæ small, rufo-fulvous. Wings greyish hyaline; stigma small, dark red; nervures dark fuscous, recurrent nervures reaching second cubital cell equally distant and not far from base and apex; spurs very pale; hind basitarsi very hairy, rather broad; base of claws clear red. Abdomen moderately shining, finely punctured, no hair-spots on sixth tergite.

Sudan: Wad Medani, 7. ii. 23, in house (*H. W. Bedford*).

Allied to *M. variscopa*, Pérez, which I have taken in Morocco, but smaller and much more hoary.

### *Megachile pulverella*, sp. n.

♀.—Length 8·8 mm.

Black, hoary, with abundant white hair, fulvous on vertex, dense and very white on front and sides of face; mesothorax appearing grey from the thin covering of hair; conspicuous bands of white tomentum before and behind scutellum; hair of legs white, pale reddish on inner side of tarsi; tergites with rather shaggy entire white hair bands; sixth tergite with a pair of very large round hair-patches, almost touching; ventral scopa white, black on last sternite and posterior part and sides of penultimate; mandibles broad, quadridentate, with a red apical spot and much white hair on basal part; clypeus dull and densely punctured, with a shining middle line, lower margin simple; supraclypeal area with a central smooth shining space; flagellum very obscurely brown beneath; mesothorax and scutellum dull and very densely punctured; tegulæ fulvous. Wings hyaline; stigma small, fulvous, nervures dark fuscous, recurrent nervures as in *M. variscopula*. Femora somewhat reddish; spurs light red; hind basitarsi conspicuously broad, very hairy. Abdomen closely punctured, little shining.

Sudan: Wad Medani, 1. iii. 23, "in shed of timber roof" (*H. W. Bedford*).

The following table separates it from some allied species with spots on sixth tergite:—

Mesothorax appearing grey from an abundance of light hair, pubescence not at all yellowish; light spots on sixth tergite large and round, almost touching .......................... *pulverella*, sp. n.
Mesothorax not thus appearing grey .......... 1.
1. Hair of thorax white, with some black dorsally (Asni, Morocco) ........................ *argyrea*, Ckll.
Hair on thorax yellowish; spots on sixth tergite smaller and less distinct (West Indies) ...... *concinna*, Smith.

This group of small *Megachile* (belonging to the subgenus *Eutricharæa*, Thoms.), with spots on sixth tergite, is very widely distributed, from the Canary Is. (*M. canariensis*, Pérez) to France (*M. dorsalis*, Pérez) and Turkestan (*M. communis*, Mor.). *M. concinna*, Smith, from Haiti, West Indies (in which I include *M. multidens*, Fox, from Jamaica), is so extremely close to this Old World group that I believe it to have been introduced in the days of the slave trade. This is the more probable because these insects frequent dwellings, and at Port-au-Prince, Haiti, Dozier reared *M. concinna* from nests found in rafters of dwellings, and in one case they filled up and short-circuited a switch-box on the side of a house. Furthermore, we already know that *M. martindalei*, Fox, described from Jamaica, is the Old World *M. lanata* (Fabr.); while *M. atriceps*, Cresson, described from Cuba, and now found by Dozier in Haiti, is apparently African, and closely allied to *M. nigriceps*, Friese. Cresson quotes Poey to the effect that *M. atriceps* nests in dry wood, in the manner of *Xylocopa*.

### *Megachile cyanipennis*, Guérin.

♂.—Sudan: Suamsat, July, 1921 (*J. E. M. Mellor*, no. 29.)

This agrees with Guérin's short account (type from Senegal), and as the species is a very striking one, I feel confidence in the determination. The wings are extremely dark; sixth tergite rounded and simple; legs chestnut-red; anterior coxæ with sharp spines; anterior basitarsi with a hollowed boat-like structure, but the tarsi not very broad. The nearest relative I possess is *M. geoffrei*, Ckll., and of this I have only the female. Meade-Waldo remarks that F. Smith had erroneously labelled *M. geoffrei,* in his collection, as *M. cyanipennis.*

### *Megachile thomasseti*, sp. n.

♂.—Length about 11 mm., anterior wing 7·8.

Black, with parallel-sided abdomen; pubescence mostly rather dull white, but pure white on cheeks and face, except a long brush of yellowish-white hairs across face at level of top of clypeus; hair of vertex very pale fulvous, of mesothorax and scutellum slightly yellowish, but no black; eyes grey above, the lower half red; mandibles pure black, strongly tridentate, the apical part shining; clypeus entirely hidden by long hair; vertex dull and densely punctured; antennæ black, long, and slender, not enlarged at end; mesothorax and scutellum dull and excessively densely and finely punctured; thorax above with abundant long hair; no band before scutellum, but a slender, rather inconspicuous hair-band behind it; tegulæ brownish fulvous. Wings greyish hyaline; stigma rudimentary, dark reddish; nervures black; second cubital cell receiving first recurrent nervure twice as far from base as second from apex; anterior coxæ with stout spines, and a patch of red hair above each; anterior femora, tibiæ (except a little black at base and apex), and tarsi bright ferruginous, but middle and hind legs black, except apical part of tarsi; anterior tarsi stout but not much modified, but with a black spot on inner side and a long white fringe; hind tarsi with a very long white fringe anteriorly. Abdomen closely punctured, somewhat glistening, first tergite with long greyish-white hair, pure white at sides; tergites 1 to 4 with apical white hair-bands, other hair on second pale, but on third and fourth short and black; fifth with some white hair at base, but apical part with long black hair; sixth above with dense pure white hair, except apical middle, where it is bare and black; there is no longitudinal keel, but the apical margin (transverse keel) shows a pair of sharp triangular teeth, and more to the side sharp spine-like teeth, two on each side, wide apart; venter with white hair-bands.

Natal: Weenen, Nov.–Dec., 1923 (*H. P. Thomasset*).

Resembles *M. bevisi*, Ckll., but quite distinct by anterior tarsi, &c. There is some resemblance to *M. basalis*, Sm., and *M. konowiana*, Friese. The teeth at apex of abdomen suggest *M. arnoldiana*, Brauns, but that is otherwise very different. The mesothorax is much more finely punctured than in *M. stellarum*, Ckll.

The three following females (*M. carpenteri*, *M. gowdeyi*, *M. caricina*) from Uganda all agree precisely in the ventral scopa, which is white at base, then (three sternites) very bright ferruginous, and wholly black on last (sixth) sternite. They also agree in having the wings strongly clouded, but not dark enough to be called fuliginous, and not at all orange.

They can be separated thus:—

| | | |
|---|---|---|
| | Face with copious orange hair | *carpenteri*, sp. n. |
| | Face without copious orange hair | 1. |
| 1. | Abdomen with red hair-bands | *gowdeyi*, sp. n. |
| | Abdomen without red hair-bands | 2. |
| 2. | Abdomen with broad, pale, fulvous hair-bands | *patellimana*, Spin. |
| | Abdomen without such bands | 3. |
| 3. | Wings evidently bicoloured, fuliginous, with hyaline base | *callichlora*, Ckll. |
| | Wings not thus bicoloured | 4. |
| 4. | With red hair below clypeal margin | *caricina*, Ckll. |
| | No red hair below clypeal margin | *stellarum*, Ckll. |

### *Megachile carpenteri*, sp. n.

♀.—Length nearly 12 mm., anterior wing 8.

Black, of ordinary form; hair of face (the long hairs meeting over middle of clypeus) light orange; cheeks with long and abundant pure white hair; sides of front with long white hair, vertex with black; eyes light grey; mandibles entirely black, with a very long cutting-edge, the two middle teeth grooved on outer face; antennæ entirely black; vertex glistening but closely punctured; thorax with rather dull white hair, on mesothorax and scutellum thin and strongly mixed with black, on scutellum nearly all black; mesothorax and scutellum very densely punctured, a little shining; no trace of a light band before or behind scutellum; hair of mesopleura very long and dense; upper part of area of metathorax shining; tegulæ reddish brown; wings dusky, nervures black; second cubital cell receiving first recurrent nervure about twice as far from base as second from apex. Legs black, with mostly white hair, red on inner side of tarsi; end of middle tibia with two red triangular spines, and of hind tibia with a broad and short out-turned red lamina; front tibia with a single red apical spine; middle and hind basitarsi broad; spurs very pale; tarsi red at apex. Abdomen broad, shining, with distinctly separated punctures; no continuous bands, but elongate-triangular dense patches of shaggy white tomentum at sides of tergites 1 to 5; discs of segments 1 to 5 (very short on 3 to 5) with black hair; sixth tergite with greyish-white hair, the apical part black, with black hair.

Uganda: Busongoro Toro, Dec. 1927 (*G. D. H. Carpenter*).

The lateral markings of the abdomen are like those of *M. caricina*, Ckll., but the hair of the face is quite differently coloured. Both have slight metallic tints on abdomen, and they are certainly closely allied. The hind basitarsi are even broader (more bulging anteriorly) in *M. caricina.*

### *Megachile caricina*, Cockerell.

♀.—Uganda; Gulu, May 1925 (*G. D. H. Carpenter*).

Compared with the type of *M. caricina* this is larger, with conspicuously longer hind basitarsi. I thought, therefore, to separate it, but on examining other specimens of *M. caricina* the differences seem evanescent. The clypeal margin is conspicuously arched. It is possible that better material may show that *M. caricina* (as I now have it) ought to be divided.

### *Megachile gowdeyi*, sp. n.

♀.—Length 10 mm.

Black, with broad abdomen; sides of face and front with dense shining pure white hair, cheeks with white hair; disc of clypeus with very scanty thin reddish hair, visible when seen from above; hair of vertex dark reddish fuscous; clypeus coarsely punctured, the punctures large and distinct in middle, without a smooth line; lower margin of clypeus straight and even; supraclypeal area with a large polished impunctate space; mandibles black, very faintly reddened subapically; antennæ with flagellum red beneath (only the basal part preserved in type); vertex strongly punctured; mesothorax and scutellum dull, very densely and minutely punctured; narrow but very distinct fulvous-tinted bands before and behind scutellum; hair of tubercles and upper part of sides of metathorax fulvous-tinted, of mesopleura white; thorax above nearly bare; tegulæ shining fulvous. Wings dusky, stigma and nervures dark brown; second cubital cell receiving first recurrent nervure less than twice as far from base as second from apex. Legs black, with white hair, very bright ferruginous on inner side of tarsi; spurs red; hind basitarsi broad. Abdomen well punctured, moderately shining, the tergites with entire light red hair-bands.

Uganda: Kampala, Sept. 1, 1915 (*C. C. Gowdey*).

Very near *M. ekuivella*, Ckll., but clypeus coarsely punctured and with no smooth line. Also very near *M. curtula*, Gerst., but differs by the tricoloured scopa. Also near *M. cordata*, Smith, a smaller species described from Natal.

The following six males from British E. Africa are to be separated and compared with some others, as follows:—

| | | |
|---|---|---|
| | Anterior legs at least mainly red .......... | 1. |
| | Anterior legs not thus red .............. | 3. |
| 1. | Very small; sixth tergite above densely covered with cream-coloured tomentum . | *ancillula*, Vachal. |
| | Medium size ........................ | 2. |
| 2. | Sixth tergite above nearly all covered with dense pure white tomentum .......... | *thomasseti*, Ckll. |
| | Sixth tergite above with black surface wholly exposed .................... | *rosarum*, sp. n. |
| 3. | Transverse keel of sixth tergite with teeth or denticles ...................... | 4. |
| | Keel of sixth tergite at most crenulate, without denticles .................. | 7. |
| 4. | Keel of sixth tergite with two blunt teeth bounding the rounded emargination; anterior basitarsi red and hollowed .... | *griseola*, sp. n. |
| | Keel of sixth tergite with sharp denticles .. | 5. |
| 5. | Anterior basitarsi with boat-shaped process; a narrower insect than the last species .. | *epixanthula*, sp. n. |
| | Anterior tarsi simple ................... | 6. |
| 6. | Scutellum with red hair ............... | *tenuinervis*, sp. n. |
| | Scutellum with black hair ............. | *chrysopogon*, Vachal. |
| | Scutellum with dull white hair; small species ........................... | *gratiosa*, Gerst. |
| 7. | Mesothorax and scutellum covered with erect black hair .................... | *melanoleuca*, sp. n. |
| | Thorax above not thus black-haired, though with much black hair .............. | *opacula*, Ckll. |

On the coxal spines they may be divided thus:—

| | | |
|---|---|---|
| | No coxal spines ...................... | *melanoleuca*, sp. n. |
| | Coxal spines present .................. | 1. |
| 1. | Coxal spines very large and long .......... | *rosarum*, sp. n. |
| | Coxal spines small or moderate .......... | 2. |
| 2. | Coxal spines distinctly developed ........ | *griseola* and *epixanthula*, sp. n. |
| | Coxal spines so small as to be almost rudimentary . | *chrysopogon*, Vach., and *tenuinervis*, sp. n. |

On the venation they separate thus :—

| | | |
|---|---|---|
| | Basal nervure and stigma ferruginous .... | 1. |
| | Nervures black ........................ | 3. |
| 1. | Basal nervure nearly or quite meeting nervulus; marginal cell long ............ | 2. |
| | Basal nervure falling a considerable distance short of nervulus; marginal cell shorter. | *epixanthula*, sp. n. |
| 2. | Upper half of marginal cell with a strong dusky shade ........................ | *rosarum*, sp. n. |
| | Upper half of marginal cell with no strong dusky shade ........................ | *griseola*, sp. n. |
| 3. | First recurrent nervure distant from first intercubitus equal to about half length of latter; basal nervure not far short of nervulus; nervures strong, very dark...... | *melanoleuca*, sp. n. |
| | First recurrent nervure distant from first intercubitus not nearly equal to half length of latter; nervures more delicate. | [*tenuinervis*, sp. n.<br>*chrysopogon*, Vach., and |

The hair of thorax is white mixed with black in *M. melanoleuca* and *M. chrysopogon*, but without black in the other five.

### *Megachile chrysopogon*, Vachal.

♂.—Kenya Colony; Kabete, 6000 ft., Oct. 31, 1918, "roses" (*T. J. Anderson*).

The first recurrent nervure is much nearer base of second cubital cell than in *M. semierma*, Vach. I have seen *M. chrysopogon* in the Congo Museum.

### *Megachile rosarum*, sp. n.

♂.—Length about 11 mm., anterior wing 7·3.

Black, with long abundant pale hair, faintly yellowish dorsally on head, thorax, and abdomen; long, silky, and cream-colour on face, covering clypeus; dull white on cheeks and sides of thorax, white also on front; mandibles stout, black, with an apical red band; beneath, the mandibles are produced to a large triangular tooth or lamina; when the cheeks are seen from below they appear bicoloured, the lower part with pure white hair, and above this, beginning abruptly, pale fulvous; vertex dull, very densely and finely punctured; antennæ black, except that the third and fourth joints are red beneath, apical joint enlarged; mesothorax and scutellum entirely dull, with very long hair; tegulæ ferruginous. Wings dusky hyaline; first recurrent nervure a little more distant from base of second cubital cell than second from apex. Legs with mainly white hair; middle and hind legs dark reddish brown; large flattened spines of anterior coxæ black; anterior femora trigonal, bright ferruginous, the upper and posterior angles broadly darkened;

anterior tibiæ short and thick, bright ferruginous, with the posterior side, which is sharply keeled, broadly infuscated; anterior tarsi pale reddish in front, first three joints broadened and cream-colour posteriorly, the second and third externally with a black spot at base, and there are also black spots on inner side; posterior fringe long and white; middle basitarsi densely covered with white hair on outer side; hind basitarsi very peculiar, very short and broad, bulging anteriorly, with red hair on inner side and behind; hind spur of hind tibia short. Abdomen with abundant long hair, cream-coloured on first tergite, more distinctly fulvous on next two, but on third white basally; fourth basally pale, then a transverse band of fuscous, then a thin greyish apical band; fifth with long black hair; sixth above so thinly hairy as to appear bare, rugose, with a large circular median depression; transverse keel prominent, shallowly emarginate in middle, not at all denticulate, seventh segment truncate (weakly emarginate), with sloping sides; venter with bands of long white hair.

Kenya Colony: Kabete, 6000 ft., Oct. 26, 1918, "roses" (*T. J. Anderson*).

A very distinct species, known by the structure of the legs.

### *Megachile griseola*, sp. n.

♂.—Length 10 mm., anterior wing 7·8.

Black, including mandibles and the simple antennæ (flagellum very obscurely reddish beneath); eyes light yellowish; mandibles with a tuft of white hair at base; face densely covered with creamy-white hair, contrasting with the pure white of cheeks; vertex, thorax above, and basal two tergites with long creamy-white hair; vertex, mesothorax, and scutellum entirely dull; tegulæ clear rufous; wings hyaline, a little dusky; legs with white hair, pale red on inner side of tarsi; anterior coxæ with rather short stout spines; anterior tarsi little broadened, but with a long white fringe behind; the basitarsi black, with a red boat-shaped lateral process; small joints of anterior tarsi clear red, as also the apical joints of the others; middle tarsi with a long white fringe behind; hind tarsi ordinary; abdomen finely punctured, somewhat shining; tergites 1 to 5 with loose dull white hair-bands; apical part of fifth with pale fulvous hair; sixth broadly rounded; above with a rather thin covering of yellowish-white hair, except the broad apical part, which appears bare and black; transverse keel with a median emargination, on each side of which is a stout tooth, and beyond these, on each side, one or two smaller teeth; no apical spines beneath; sternites pale margined, and with long white hair.

Kenya Colony: Masai Reserve, May 24, 1913 (*T. J. Anderson*).

### *Megachile epixanthula*, sp. n.

♂.—Length 10 mm., anterior wing 7.

Black, including mandibles and the simple slender antennæ; mandibles with much white hair on outer side; hair of face and vertex cream-coloured, but of lower part of cheeks pure white; vertex glistening; mesothorax and scutellum wholly dull; thorax above with pale yellow hair; at sides and beneath the hair to white; tegulæ pale testaceous, with whitish margins; wings hyaline, faintly dusky; second cubital cell receiving recurrent nervures equally distant from base and apex; legs black, with white hair, tarsi rufescent apically; anterior basitarsi like those of the last species, with a red, narrow, boat-shaped process; apical half of hind tibiæ with a broad band of dense white hair behind; spurs red; abdomen finely punctured, dorsally with pale fulvous hair, beneath and on sixth tergite with white; tergites 1 to 4 with ochreous hair-bands, the first two slender and inconspicuous, the other two broad and conspicuous; first tergite with a transverse fringe of very long erect hair, bounding the basal declivity; tergites 2 and 3 with ochreous tomentum on basal part, followed by a dark band, but 4 and 5 practically all dark except for the apical bands, the black hair on fifth tergite not long; sixth tergite densely covered with pure white tomentum, except a large black apical triangle, the appearance being of three triangles, a median black one with apex basad, and a white one on each side of it, with apices caudad; transverse keel produced, irregularly dentate, without a well-defined median emargination; beneath are four widely-spaced spines, the outer ones shortest; venter with two entire very conspicuous white hair-bands.

Tanganyika Territory: Mbuyuni, Serengetti Plains, May 27, 1916 (*T. J. Anderson*).

### *Megachile tenuinervis*, sp. n.

♂.—Length 8·5 mm., anterior wing 6·6.

Very like the last species, with exactly the same black and white triangles on sixth tergite, the same kind of head and hair of face (but eyes green instead of reddish ochreous), the same sort of tegulæ (but smaller and a little darker), &c. The principal points of difference are as follows:—Vertex with longer, browner hair, mesothorax also appearing browner, though not actually brown, and the scutellum with clear red hair; anterior tarsi black and simple; hind tibiæ much less robust; abdominal bands grey, not distinctly ochreous; sixth tergite less produced, with a large semicircular interval between the midmost teeth; the four spines beneath are lacking; the white ventral bands have longer hair.

Kenya Colony: Kikuyu, Oct. 11, 1918 (*T. J. Anderson*).

While this species is amply distinct from the last, they are evidently closely related. From this and other cases we are led to reflect on the kaleidoscopic evolution of the species of *Megachile*; characters seem to come and go in different series, making it difficult to establish natural subgenera. Thus it would seem very convenient to separate those with modified tarsi in the male from those in which the tarsi are simple, but such an arrangement would certainly be artificial.

### *Megachila melanoleuca*, sp. n.

♂.—Length about 11 mm., anterior wing 8.

Black, rather robust, parallel-sided, with black and white hair, but cream-coloured on face, dark fuscous on vertex, and bright red on inner side of hind tarsi; mandibles black, the apical tooth long and sharp; eyes grey, slightly reddish; hair of cheeks very abundant and pure white; mesothorax and scutellum hardly at all shining, the punctures on disc of mesothorax distinct; mesothorax and scutellum with long black hair, metathorax and sides of thorax (including tubercles) with white; tegulæ very dark brown, nearly black; wings dusky, somewhat violaceous, with black stigma and nervures. Legs with much white hair, anterior tarsi simple; hind tarsi long and quite robust. Abdomen glistening; first tergite with very long white hair, on the apical middle with some long black hair; tergites 2 to 5 with abundant black hair, and at sides broad pure white hair-bands, which become linear and evanescent across the middle; sixth tergite with dense white hair above, and a broad black apical triangle; transverse keel broadly rounded, irregularly undulate, not dentate; no spines beneath; ventral pure white hair-bands very broad. The antennæ are broken, but enough remains to show that they are black.

Kenya Colony: Masai Reserve, May 16, 1913 (*T. J. Anderson*).

# IV.—*Exotic* Muscaridæ (*Diptera*).—XXXIV. By J. R. Malloch, Bureau of Biological Survey, Washington, D.C.

## Family Chloropidæ.

### Subfamily *Oscinosominæ*.

### Genus Macrostyla, Lioy (=*Rhodesiella,* Adams) *.

This is the same genus as *Meroscinis,* de Meijere. I have been able to obtain a number of species from Africa and the Orient, and have made a careful survey of those available to determine the status of the genus and the identity of the various species, and particularly the genotype, *tarsalis,* Adams, which incidentally has been accepted as identical with *scutellata,* de Meijere, the genotype of *Meroscinis.* In the following pages I record my findings, and hope that the data presented may prove of use to students of the group and also in elucidating the distribution of species.

There are three fairly well-defined groups in Becker's key, published in 1911 in his paper on Indo-Australian Chloropidæ, and I have accepted the definitions given by him as the basis for my separations herein, though they are not by any means to be taken as natural groups, there being various structural characters present that undoubtedly are of more value for natural groupings than those utilized here. It is, however, impractical for me at this time, with the small amount of available material, to attempt a more pretentious treatment of the genus, and I merely describe a few of the new species and present keys for the separation of those known to me.

### Group *tarsalis.*

This group contains all species in which the scutellum is elongate-subtriangular, with the bristles, or at least the apical pair, on elevated bases, the femora or tibiæ partly or entirely black, and occasionally the tibiæ also dark-coloured. Many of the species have the hind femora distinctly thickened and furnished with microscopic teeth or blunt spines on part of the ventral surface. This character has been used in both of the subfamilies of Chloropidæ as a generic character, but I rather incline to think that its importance has been over-estimated, and make no suggestion that in this genus the possession of ventral denticles is sufficient ground for even the recognition of a subgenus. I have found in the genus *Chlorops* in Australia a somewhat similar division of the species, and in the latter case the discovery rather weakens the claim of *Chloromerus*, Becker, to generic distinction from *Chlorops*.

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* Lamb, in his paper on this family in this Magazine in 1918, p. 333, noted that there was some question of priority in connection with the genus-name, but did not state definitely what he meant, merely giving a reference to a paper by Adams. Later Bezzi published the synonymy and sunk *Meroscinis* as the same as *Rhodesiella.* In the same paper in this Magazine, Lamb recorded the European species *plumigera* as belonging to the genus, but he gave Loew as the author of it. Becker had previously accepted this species as belonging to *Gaurax,* Loew, and correctly gave the author as Meigen. It is of more than passing interest to note that the species is evidently correctly placed in *Rhodesiella,* and that being the case, the genus-name will have to be changed to *Macrostyla,* Lioy, of which it was the only originally included species.

## *Key to the Species.*

1. Knobs of halteres dark brown or black.... 2.
Knobs of halteres clear yellow or whitish yellow .......................... 12.
2. Aristæ bare; wings, including the veins, milk-white on basal third, brownish beyond; legs, including the fore coxæ, yellow, apical two-thirds of hind femora, basal two-thirds of hind tibiæ, and basal half of mid-tibiæ black; palpi red. (Africa.) ........................ *bicolor*, Becker.
Aristæ distinctly pubescent, frequently almost short-haired; wings entirely hyaline, the veins usually dark........ 3.
3. Frontal triangle sharp or reduced to a narrow rounded point at anterior extremity; all tarsi yellow; apical sections of veins 3 and 4 parallel, the fourth almost without a deflection beyond outer cross-vein ........................ 4.
Frontal triangle quite broadly truncate at anterior extremity, *i. e.*, continued widely to anterior margin of frons; tarsi in part black or brown, at least the apical segment of one pair darkened ........ 5.
4. Legs black, the tarsi entirely yellow; scutellum with two long apical and four much shorter lateral bristles. (Ceylon.) *foveata*, Lamb.
Legs yellow, coxæ, femora except their extreme apices, hind tibiæ except their bases and apices, black, fore and mid-tibiæ more or less distinctly browned centrally; scutellum with two long apical and two very short preapical bristles; hind femora not much thicker than mid pair and not microscopically dentate below .................... *macgregori*, sp. n.
5. Fourth and fifth segments of fore tarsi fuscous, the basal three segments yellow. 6.

Third, fourth, and fifth segments of fore tarsi fuscous, basal two segments yellow . 8.

6. Hind femora very much thicker than mid pair and with microscopic denticles on a portion of ventral surface .......... *scutellata*, de Meijere.

Hind femora very slightly thicker than mid pair and without ventral denticles . 7.

7. Apices of mid- and hind tibiæ rather broadly yellow, fore pair but faintly infuscated centrally .......................... *nigrifrons*, sp. n.

Mid- and hind tibiæ entirely black, fore pair narrowly yellow at apices ........ *tarsalis*, Adams.

8. Males .............................. 9.

Females .............................. 10.

9. Fore tarsi slender, with fine erect hairs on posterior side, those on basal segment most noticeable and distinctly longer than the diameter of the segment; fore tibia thickened from base to apex, much stouter than usual; apical ventral bristle on mid-tibia about as long as basal segment of tarsus and very fine and hair-like at apex .................... *hirtimana*, sp. n.

Fore tarsi stouter, without fine erect hairs on posterior side; fore tibia normal, slightly thickened apically; mid-tibia with the apical bristle on ventral surface much shorter than basal segment of mid-tarsus and of the usual form ...... *normalis*, sp. n.

10. Third antennal segment entirely, or almost entirely, black; frontal triangle metallic violet-blue. (Seychelles, Africa ?) .... *æneifrons*, Lamb.

Third antennal segment entirely reddish yellow, or with only a narrow dark upper margin ...................... 11.

11. Frontal triangle bright blue ............ *normalis*, sp. n.

Frontal triangle violet-blue ............ *hirtimana*, sp. n.

12. Aristæ bare; wings, including the veins, milk-white on basal third, brownish beyond; legs yellow, knees of hind pair, a ring on middle of all tibiæ, and apical segment of fore tarsi brown. (Africa.) . *annulata*, Becker.

Aristæ distinctly pubescent, sometimes almost short-haired.................. 13.

13. Scutellum with six quite long bristles situated on elevated bases, the two lateral pairs fully half as long as the apical pair; epistome quite noticeably protruded (see fig., p. 56); apices of all tibiæ distinctly yellow; frons at vertex wider than its length at centre.............. *sexseta*, de Meijere.

Scutellum with two long bristles situated on elevated bases and one or two minute bristles on each side usually situated on slightly elevated bases, or, if the lateral bristles are well developed, there is but one on each side .............. 14.

14. Third wing-vein quite distinctly curved forward at apex, the fourth straight or slightly downwardly sloped at apex, so that the section of the costa between the apices of those veins is subequal to, or very slightly shorter than, the section between apices of veins 2 and 3........ 15.

Third and fourth veins subparallel on their apical sections, both slightly and regularly curving forward, the section of costa between their apices very much shorter than the one between apices of veins 2 and 3, not over half as long as it. 18.

15. Scutellum almost as long as the mesonotum and about twice as long as its basal width, much narrowed to apex, with four finger-like processes which are about three times as long as thick, two at apex and two at or slightly basad of middle, the terminal pair with the apical bristles at least twice as long as those on lateral pair, the lateral edges between the processes each with four or five minute papillæ, each of which has a fine apical hair; legs, including the coxæ, stramineous, all femora with a broad, submedian, interrupted dark annulus, fore tibiæ and tarsi dark brown, mid- and hind tarsi not darkened; third antennal segment twice as wide as long ........ *antennalis*, sp. n.

Scutellum distinctly shorter than the mesonotum and less than twice as long as its basal width, the lateral bristles when present situated much closer to apex than to base, and no minute lateral papillæ evident; legs not coloured as above, the femora more extensively blackened, and the fore tibiæ and tarsi not entirely black-brown; third antennal segment less than twice as wide as long ........ 16.

16. Scutellum of the usual subtriangular form, with but two apical bristles; legs black, trochanters, knees, bases and apices of tibiæ, and entire tarsi yellow, the fore tibiæ sometimes without distinct dark marking ......................... *nitidifrons*, Becker.

Scutellum less elongate and narrowly rounded at apex, not truncate, with two strong apical and two slightly weaker preapical bristles.................... 17.

17. Legs yellow, all coxæ, femora except their apices, and a broad submedian band on hind tibiæ black, apical segment of all tarsi brownish; wing with a faint brownish cloud on disc just beyond outer cross-vein ......................... *divergens*, sp. n.

Legs yellow, coxæ, femora broadly in middle black, apical two segments of fore and apical segment of mid- and hind tarsi brown; wings clear ................ *finitima*, Becker.

18. Legs pale reddish yellow, fore tibiæ and fore tarsi black-brown; frontal triangle glossy black ........................ 19.

Legs black, tarsi yellow except the apical segment of fore and mid pairs and the fourth and fifth segments of hind pair, which are brown; frontal triangle metallic blue-green ...................... *femoralis*, sp. n.

19. Mid- and hind tibiæ entirely yellow; wing-veins yellow basally, third slightly curved apically .................... *pellucida*, Becker.

Mid- and hind tibiæ largely blackened; wing-veins entirely dark, apical section of third vein straight ................ *albicapilla*, de Meijere.

### *Macrostyla plumigera* (Meigen).

This species is the genotype, as already stated, but it is unknown to me. Lamb has recorded it from Natal and S. Rhodesia. According to Becker's description in his paper on the Palæarctic Chloropidæ, it differs from *divergens* and its nearest allies in having the femora blackened in middle and the tibiæ yellow, possibly falling very close to *finitima*, Becker; but the venation of the wings is not mentioned by Becker, so that it is impossible for me to tell if it falls in caption 17 in the above key.

Described from European examples.

### *Macrostyla bicolor* (Becker).

### *Macrostyla annulata* (Becker).

These two African species are very similar in having the aristæ bare and the wings white at bases and browned on apical two-thirds; but *bicolor* has the halteres dark, while in *annulata* these organs are yellow. The colour of the legs is different in the two species. Possibly the species are wrongly placed in this genus.

Neither of the species is known to me except from their descriptions.

### *Macrostyla tarsalis* (Adams).

This species has been listed as a synonym of *scutellata*, de Meijere, but it is my opinion that this is an error; at least, the species identified by me as those in question are quite distinct. The African species has the hind femora in both sexes very little thicker than the mid pair and entirely without ventral denticles, while the Oriental one has the hind femora much thickened, slightly curved on ventral outline, and a portion of that surface with microscopic denticles which are visible when the femora are viewed with a very strong lens against a light and in profile. There are two very closely related African forms—the present one, with the frontal triangle metallic blue-black, and the other, briefly described below, in which it is almost entirely glossy black and without a decided blue tinge. The specimens accepted herein as *tarsalis* have the mid and hind tibiæ almost entirely black and the fore pair very distinctly yellow at apices. For other distinguishing characters, see below.

Length 2 mm.

*Locality.*—Lorenzo Marques, Africa (*C. W. Howard*). United States National Museum.

### *Macrostyla nigrifrons*, sp. n.

*Female.*—Glossy black. Frons black, the triangle glossy deep black, almost without a trace of blue colour, continued to anterior margin of frons, where it terminates in a less broadly truncate extremity than is the case with the preceding species; antennæ black, third segment red; aristæ black. Thorax with the dorsum almost smooth except the apical portion of the scutellum, which is rather noticeably punctate, the surface-hairs and all bristles dark; apical scutellar bristles long, without distinct raised bases, the small one close behind these on each side almost indistinguishable and not on a raised base; in the preceding species both the pairs of bristles are on very small raised bases. Hind femora as in *tarsalis*; tibiæ of mid and hind legs very distinctly yellow at apices, the fore pair almost entirely yellow, only faintly dark centrally; all tarsi with only the apical segment browned, while in *tarsalis* the fore tarsi have the apical two segments browned. Third costal section of wing longer than second, the latter longer than fourth.

Length 1·5 mm.

*Type*, Gatooma, S. Rhodesia, January 1930 (Dept. Argic.). British Museum.

### *Macrostyla macgregori*, sp. n.

*Male.*—Head black, frontal triangle highly polished, attaining anterior margin, where it terminates in a very narrow rounded point, its sides straight; antennæ rather small for this genus, the third segment brownish red; aristæ distinctly pubescent; cheeks linear; palpi brown. Mesonotum glossy black, with a rather distinct bluish tinge, the surface quite closely covered with moderately large piliferous punctures, the notopleurals very fine, humeral indistinguishable, the surface-hairs fuscous; scutellum elongate, subtriangular, about two-thirds as long as mesonotum, its apex narrowly rounded and with two long bristles, which, like two very minute setulæ anterior to them, are situated on minute elevated bases, the surface more coarsely piliferous punctate than the mesonotum except at base. Legs rather stout, the hind femora not much stronger than the mid-pair and without microscopic ventral denticles on any portion of the ventral surface; femora and coxæ almost entirely, and the basal two-thirds of hind tibiæ, black-brown, other tibiæ with basal two-thirds less dark in colour, tarsi entirely yellow, the hind pair longer and more slender than usual. Third wing-vein very slightly bent forward at apex, the section of costa between it and fourth vein hardly more than half as long as the preceding one; fourth vein almost straight beyond the outer cross-vein.

Length 1·5 mm.

*Type*, Manila, P.I. (*R. Brown*). United States National Museum.

Named in honour of R. C. McGregor, editor of the 'Philippine Journal of Science,' who has sent many specimens of this and other families of Diptera for study.

### *Macrostyla scutellata* (de Meijere).

In the original description of this species there is particular mention of the thickened hind femora, and should it come to pass that some specialist with a leaning towards multiplication of genera takes it upon himself to recognize this as a basis for splitting up the present concept, then *Meroscinis*, de Meijere, may be resurrected to contain *scutellata* and other Oriental species which possess this character.

There is no mention in de Meijere's description of the colour of the halteres, but Becker, in his key to the species in 1911, placed it in the group in which these organs are fuscous. I have four specimens which appear to agree very well with the species accepted by Becker, but am not at all confident that they are all the same. The one from the Philippines is probably correct, having the frontal triangle very bright blue-green and quite broadly truncate at anterior extremity, the tibiæ all very noticeably yellow at apices, the tarsi yellow, apical two segments of fore pair and apical segment of mid and hind pairs brown or fuscous, and the hind femora very decidedly thicker than the mid-pair, and with numerous ventral denticles apically. I have a little doubt about the identification of the specimen from China, but it is entirely probable that the Hawaiian specimens are *scutellata*. I should like to see more specimens from these localities before committing myself to a definite decision.

Length 2 mm.

*Localities.*—Manila, P.I. (*R. Brown*); Waimea, Hawaii, 6. xviii. 1922 (*J. F. Illingworth*); Tantalus, Oahu, Hawaii (*W. H. Ashmead*); and Suifu, Szechuen, China (*D. Graham*).

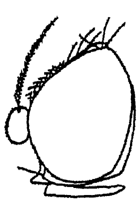
### *Macrostyla æneifrons* (Lamb).

This species was originally described from the Seychelles, and its describer, in the paper referred to under the genus herein, recorded its occurrence in Africa. I am rather inclined to doubt the correctness of the later record. I have before me a female specimen which agrees very well with the original description except that the frontal triangle is violet-coloured instead of blue. The fore tarsi have the apical three segments fuscous, while the mid and hind pairs have only the apical two segments of that colour. The black antennæ are a character that serve to cause me to place my specimen in this species. The scutellum has the surface much more distinctly piliferous punctate than the mesonotum, and besides the long apical pair of bristles there are two minute bristles on each side on apical third, all of which are situated on small elevated bases.

Length 2·5 mm.

*Locality.*—Salisbury, S. Rhodesia, 1. v. 1927 (*A. Cuthbertson*).

Lamb recorded the species from Durban.



Head of *Macrostyla sexseta* from the side.

### *Macrostyla sexseta* (de Meijere).

This small species is readily distinguished from its nearest relatives by the presence of six rather long bristles on the scutellum, the apical pair being very little longer than the others, comparatively speaking. The mouth-margin is also more produced than usual in the genus (see fig., p. 56), the frontal triangle is glossy black, with a slight blue tinge, the apices of all tibiæ are yellow, and the tarsi are yellow, with the apical three segments of fore tarsi and the apical segment of mid and hind pairs dark brown.

Length 1·75 mm.

*Locality.*—Mt. Maquiling, Luzon, P.I. (*C. F. Baker*).

My only specimen of the species was sent to me several years ago by the collector.

### *Macrostyla antennalis*, sp. n.

*Female.*—A glossy black species, with the legs much more conspicuously yellow than in any other in the present group. Frontal triangle glossy black, with a slight bluish tinge, its anterior half or more with some microscopic shallow punctures, in each of which there is a minute hair, the anterior extremity moderately broad but not definitely truncate; antennæ orange-yellow, much larger than usual, the third segment about twice as wide as long, its apex very broadly rounded; aristæ densely black pubescent; palpi fuscous; hairs pale, ocellar and vertical bristles dark. Thorax glossy black, rather coarsely wrinkled or piliferous punctate, the scutellum about as long as mesonotum and more coarsely wrinkled, much tapered to apex, where there are two pedunculate bristles, the lateral pedunculate bristles close to middle on each side and not as short as usual in this group. Legs yellow, fore coxæ blackish at bases, all femora centrally with an interrupted blackish annulus, fore tibiæ and tarsi dark brown, other tibiæ and tarsi yellow; hind femora thicker than mid-pair, thickest at bases, tapered apically, and without ventral denticles. Second costal section distinctly longer than third, the latter about one-fourth longer than fourth; third vein quite noticeably curved forward at apex, fourth slightly curved up just beyond outer cross-vein.

Length 1·75 mm.

*Type*, Mt. Maquiling, Luzon, P.I. (*C. F. Baker*). United States National Museum.

### *Macrostyla divergens*, sp. n.

*Female.*—A glossy black species, with a slight greenish tinge on mesonotum and scutellum, the abdomen more brownish, the frontal triangle glossy black, and the lateral portions of frons more distinctly shining brown than usual; antennæ orange-yellow, basal two segments dark brown; aristæ fuscous; cephalic and thoracic bristles dark, the fine hairs yellowish brown. Legs yellow, all coxæ, femora except their extreme apices, and a broad annulus on hind tibiæ black; apical segment of each tarsus brownish. Wings hyaline, with a faint dark cloud on disc, the inner margin of which is at upper extremity of outer cross-vein and its outer margin about basal third of ultimate section of fourth vein. Halteres yellow.

Frontal triangle rather narrowly truncate on anterior extremity of frons, its surface smooth; antennæ rather small, third segment disc-like; aristæ distinctly pubescent; cheek a little more evident than in typical species of the genus. Mesonotum less coarsely wrinkled than scutellum, the latter longer than its basal width, with four bristles, the apical pair fully three times as long as the preapical pair, the latter rather close to the apical pair, and all four on elevated bases, the apex more distinctly rounded than usual in this section. Hind femora slightly thicker than mid-pair. Sections of costa from second to fourth becoming successively longer, the third vein very distinctly bent forward apically, fourth practically straight on apical section; penultimate section of third vein about half as long as penultimate section of fourth.

Length 1·75 mm.

*Type*, Salisbury, S. Rhodesia, 18. iv. 1927 (*A. Cuthbertson*). In British Museum of Natural History.

### *Macrostyla nitidifrons* (Becker).

### *Macrostyla finitima* (Becker).

### *Macrostyla pellucida* (Becker).

### *Macrostyla albicapilla* (de Meijere).

All four of these Oriental species are unknown to me except from the descriptions.

### *Macrostyla femoralis*, sp. n.

*Male and Female.*—This species has much the appearance of *scutellata*, de Meijere, as accepted in this paper, the principal distinguishing character consisting of the pale knobs to the halteres. The frontal triangle is glossy metallic blue, the third antennal segment is reddish yellow with the upper margin frequently narrowly darkened, the aristæ are fuscous and very distinctly pubescent, the cheeks are almost indistinguishable, and the triangle is quite widely truncate at anterior extremity. The mesonotum and scutellum are very distinctly wrinkled, the latter is much longer than its basal width, about two-thirds as long as the mesonotum, and has, besides the two long apical bristles, a very short one on each side, both pairs on short elevated bases. The legs are black, with the basal two segments of fore, and the basal three segments of hind, tarsi brown. The hind femora in both sexes are much swollen and are armed on a portion of their ventral surfaces with minute denticles, the male having besides two or three very short black bristles on the posteroventral surface close to base which are not present in the female. Second section of costa hardly more than half as long as first or third and subequal to fourth; third vein slightly curving forward on its apical section, fourth subparallel with third apically, distinctly flexed just beyond outer cross-vein; penultimate section of third vein hardly longer than inner cross-vein and about one-fourth as long as penultimate section of fourth.

Length 2–3 mm.

*Type*, male, allotype, and seven paratypes, Mt. Maquiling, Luzon, P.I. (*C. F. Baker*).

Type, allotype, and five paratypes in collection of the United States National Museum; two paratypes in my collection sent to me by the collector, one of which will be deposited in the British Museum.

### *Macrostyla nigrovenosa* (de Meijere).

I am unable to place this species in the key because of the lack of information on certain characters. It would appear probable that it falls as an intermediate form at caption 3 of the key, having a narrow anterior margin to the glossy black frontal triangle and the third wing-vein distinctly forwardly bent. The tarsi are also dark at apices, though how many segments are dark is not stated by the describer. If it is segregated with *foveata* and *macgregori* the dark apices of the tarsi and the forwardly curved third vein will distinguish it from these species, and if it should run to the *scutellata* group it may be distinguished by the possession of two very short bristles on each side of the scutellum besides the large apical pair, the entirely black tibiæ, and the black frontal triangle.

It appears to be distinct from any species known to me.

*Locality.*—Sumatra.

### *Macrostyla hirtimana*, sp. n.

*Male.*—Glossy black, the frontal triangle polished and smooth, violet-blue in colour, cephalic and thoracic hairs dark. Legs black, the basal two segments of fore tarsi and the basal four on other tarsi yellow. Otherwise much as *scutellata.*

In this and the next species the hind femur of the male is thickened, with a slight but evident elevation at base of ventral surface, upon which there are several short strong black bristles. The present species is distinguished in this sex from any other known to me by the much wider fore tibia and the presence of fine erect hairs on the posterior side of the fore tarsus, as well as the much longer apical ventral bristle on the mid-tibia, which is very fine apically, terminating in a fine hair. In all the specimens available to me there are two very small closely-placed bristles on each side of the scutellum basad of the large apical pair, which is not the case in *normalis.*

Length 3 mm.

*Type* and three paratypes, Tjbodas, Mt. Gede, Java (*Bryant & Palmer*). United States National Museum.

### *Macrostyla normalis*, sp. n.

*Male and Female.*—Quite similar to the preceding species in coloration except that the frontal triangle is metallic blue instead of violet-blue. Structurally the male may be distinguished by the normal fore tibiæ and tarsi and the unmodified apical ventral bristle of the mid-tibia. This sex has also but one short bristle on each side of the scutellum which is farther from the apical one than is the basal one in *hirtimana.* The female has no bristles on an elevation at base of ventral surface of the hind femur.

Length 2–3 mm.

*Type*, allotype, and 23 paratypes, Manila, P.I. (*R. C. McGregor, R. Brown*); 10 paratypes, Tjbodas, Mt. Gede, Java (*Bryant & Palmer*); 1, Pelaboean, Ratoe, Java (*Bryant & Palmer*). United States National Museum.

### *Macrostyla* sp.

A female specimen before me differs from the next preceding two in having the scutellum in the male with the single lateral bristle much farther from the apical pair than usual. It agrees very well with the male of *normalis,* but the female which I connect up with the latter has usually two minute lateral bristles on each side, as in the male of *hirtimana.* I may have erred in my associating of the species, but only further accessions of material will determine this.

*Locality.*—Tjbodas, Mt. Gede, Java (*Bryant & Palmer*).

### *Macrostyla lucidifrons* (de Meijere).

### *Macrostyla sumatrensis* (de Meijere).

I have not seen the descriptions of these two species, and therefore am unable to include them in my key or to state which group they belong to.

### Group *elegantula.*

This group is distinguished from the preceding one by the entirely yellow femora and tibiæ, only the tarsi being sometimes in part infuscated. The scutellum is elongate triangular, with at least the apical pair of bristles usually situated upon short elevated bases. The wings are immaculate, and the halteres usually pale.

#### *Key to the Species.*

| | |
|---|---|
| 1. Halteres black-brown; scutellum with two long apical bristles, the lateral bristles so very small that they are almost indistinguishable .................... | *dimidiata*, Becker. |
| Halteres yellow ...................... | 2. |
| 2. Aristæ white; first posterior cell of wing hardly widened at outer cross-vein; all femora somewhat swollen ............ | *albiseta*, Becker. |
| Aristæ black or dark brown ............ | 3. |
| 3. Scutellum with two long bristles at apex and two short bristles on each side; palpi yellow: small species, not over 2 mm. in length .................... | *recta*, Becker. |
| Scutellum with two long apical bristles and but one short bristle on each side; palpi fuscous ...................... | 4. |

4. Third wing-vein much bent forward apically, so that the first posterior cell is conspicuously widened at apex ........ *conica*, Becker.

Third and fourth wing-veins parallel or almost so, first posterior cell not, or but slightly, widened apically ............ 5.

5. Apical four segments of fore tarsi deep black, basal one yellow, the fifth segment of other tarsi slightly browned; all cephalic and thoracic bristles pale; frontal triangle blue-black, entirely smooth, its anterior extremity transverse ...... *nigrimana*, sp. n.

At most the apical two segments of fore tarsi brownish or fuscous, and at least the scutellar bristles dark ............ 6.

6. Frontal triangle brilliant metallic green, with an irregular elevation beginning above middle and extending to anterior margin, its upper extremity rather abrupt, and from that point it decreases in height and increases in width to anterior extremity; antennæ entirely yellow; palpi brown; upper orbitals, ocellars, verticals, and thoracic bristles strong and black, the humeral and dorso-central bristles especially strong; apical two segments of all tarsi brown .................. *viridifrons*, sp. n.

Frontal triangle glossy black, blue-black, or violet-black, and not as above in structure; third antennal segment partly fuscous ........................... 7.

7. All segments of fore and mid tarsi yellow, the apical two segments of hind pair deep black; frontal triangle glossy black, with a number of irregular elevations on surface and several impressed lines, the deepest of the latter in centre anteriorly; all frontal and mesonotal bristles yellow, the scutellars black; first, second, and third costal divisions subequal in length. *atrifrons*, sp. n.

The apical segment of all tarsi brown, or the fourth and fifth segments of hind pair not deep black; frontal triangle blue-black, or violet-black, and of different structure from the above ...... 6.

8. Scutellum elongate, but rounded at apex, with four bristles, the apical pair about twice as long as the preapical pair; legs yellow, apical two segments of hind tarsus black-brown; apical section of fourth wing-vein almost straight: species less than 2 mm. in length ............ *quadriseta*, de Meijere.

Scutellum elongate, truncate or almost so at apex, the apical pair of bristles more than twice as long as the preapical pair. 9.

9. Frontal triangle violet-blue, with a very pronounced elongate depression in centre anteriorly; vertical, notopleural, and postalar bristles black................ *affinis*, sp. n.
Frontal triangle blue-black or blue-green, with a small central pimple-like elevation between ocelli and anterior extremity.. 10.
10. Only the apical segment of all tarsi brown; vertical bristles yellowish ............ *elegantula* (Becker).
Apical two segments of hind tarsi brown; vertical bristles fuscous or black ...... *elegantula*, var. [*hawaiiensis*, n.

### *Macrostyla dimidiata* (Becker).

### *Macrostyla albiseta* (Becker).

### *Macrostyla recta* (Becker).

The above three Oriental species are unknown to me except from descriptions.

### *Macrostyla conica* (Becker).

I identify as this species a male from the collection of the United States National Museum. It is very similar to *antennalis* of the preceding section, having the antennæ very similar in structure and size, though the third segment is a little longer in comparison with its width. The frontal triangle is glossy black, narrowed almost to a point at anterior extremity of the frons; the antennæ are entirely yellow; the palpi brown; frontal bristles and hairs dark. Thoracic hairs pale, the bristles black; scutellum with four bristles, the lateral pair slightly beyond the middle on each side, length of scutellum fully one-half that to mesonotum, the sides regularly tapered to apex. Legs, including the coxæ, yellow, fore and hind tibiæ slightly brownish, all tarsi yellow. Wings hyaline. Hind femora slightly thickened at bases, tapered to apices, without ventral denticles. First and second sections of costa subequal in length, the latter fully 1·5 as long as third, the latter almost equal to fourth; third vein bent forward apically, fourth straight apically, so that the first posterior cell is widened at apex.

Length 1·75 mm.

*Locality.*—Tjbodas, Mt. Gede, Java (*Bryant & Palmer*).

In United States National Museum.

### *Macrostyla nigrimana*, sp. n.

*Male.*—Glossy black, the mesonotum and scutellum slightly greenish tinged; frontal triangle glossy blue-black, sides brownish black, slightly shining; antennæ yellow, third segment longer than wide, narrowly darkened above; aristæ fuscous; palpi fuscous. Mesonotum quite closely covered with piliferous punctures, the scutellum rather more coarsely so, the latter fully half as long as mesonotum, its apex more rounded than usual in this section, the apical pair of bristles long, preapical pair short and quite close to the apicals, all situated on short elevated bases; bristles and hairs on head and thorax all yellow. Hypopygium smaller than usual. Legs yellow, apical four segments of fore tarsi deep black, apical two segments of hind pair slightly browned. Wings hyaline, veins dark; second costal division distinctly shorter than first or third, the latter two subequal, second fully as long as fourth, the latter over half as long as third; third vein not diverging from fourth apically, so that the first posterior cell is not widened at apex, the fourth vein slightly flexed just beyond outer cross-vein; penultimate section of third vein about equal in length to inner cross-vein. Fore legs rather long; hind femur slightly thicker than mid one, not denticulate ventrally.

Length 1·75 mm.

*Type*, Manila, P.I. (*R. Brown*). United States National Museum.

### *Macrostyla viridifrons*, sp. n.

*Male and Female.*—Glossy black, with a bluish-green tinge, most evident on the dorsum of abdomen; frontal triangle brilliant emerald-green; antennæ orange-yellow, the third segment sometimes a little brownish above; palpi dark brown; frontal hairs in part yellow, the vertical, ocellar, and upper orbital bristles black; aristæ dark, distinctly pubescent. Thoracic dorsum rather coarsely piliferous punctate, the scutellum more so than mesonotum, the scutellum not very elongate, slightly flattened on dorsum, the apex narrowly rounded and with four bristles situated on the usual short elevations, the outer, or lateral, pair of bristles very much shorter than the apicals. Legs rather stout, the hind femora thicker than the mid-pair but without ventral denticles, the ventral surface near base slightly concave, more noticeably so in the male than in the female. First and third sections of costa subequal in length, second not two-thirds as long as third and almost twice as long as fourth; third and fourth veins subparallel, the latter ending slightly behind extreme apex of wing, slightly bent a little beyond outer cross-vein; penultimate section of third vein nearly half as long as penultimate section of fourth.

Length 3 mm.

*Type*, male, allotype, and seven paratypes, Los Banos, P.I. (*C. F. Baker*).

In author's collection. Specimens will be deposited in the British Museum and United States National Museum.

### *Macrostyla atrifrons*, sp. n.

*Female.*—Shining black, the thorax and abdomen with a distinct blue tinge. Head black, frontal triangle glossy, irregularly elevated in parts, with a rather shallow sulcus on each side of the ocelli and a deep but somewhat interrupted impressed line from in front of ocelli to anterior extremity, the latter on anterior margin of frons, where it occupies about one-fourth of the width ; all frontal hairs and bristles pale ; sides of frons anteriorly brownish and slightly shining; antennæ yellow, third segment a little longer than wide, with about the upper fourth fuscous ; aristæ rather short pubescent for this genus; epistome slightly but sharply protuberant, vibrissa single, yellow, the epistomal hairs quite conspicuous, dark. Thorax and scutellum with all the hairs and all the bristles except the four on the scutellum pale, the mesonotum rather coarsely wrinkled or piliferous punctate, the scutellum rather more finely so, the latter about three-sevenths as long as mesonotum, with the usual two long apical bristles and two much shorter laterals, one on each side about one-fifth from apex, all four on elevated bases, the apex not broadly truncate, transverse only between the apical bristles. Legs, including the coxæ, honey-yellow, only the apical two segments of hind tarsi deep black; hind femur very slightly thicker than the others, without ventral denticles, the ventral surface practically straight. First section of the costa slightly longer than second, the latter equal to third, fourth about half as long as third, third and fourth veins parallel apically, fourth slightly flexed beyond outer cross-vein, penultimate section of third vein slightly longer than inner cross-vein and about one-fourth as long as penultimate section of fourth.

Length 3·25 mm.

*Type*, Mt. Maquiling, Luzon, P.I. (*F. C. Baker*).

United States National Museum.

### *Macrostyla elegantula* (Becker).

I am unfortunately rather undecided about the identity of this species, and in this respect would appear to be merely following Becker, as he had probably two species in his material when he described it, though he listed one of them as a variety. I have two very distinct forms in hand now, and, though they may be different species, I am accepting them merely as varieties pending receipt of additional material. They may be separated as follows :—

| | |
|---|---|
| A. Only the apical segment of each tarsus brown; all the hairs and bristles on head yellow; first section of costa distinctly longer than second, second and third subequal. . . . . . . . . . . . . . . . . . . . . . . . . . . | *elegantula* (Becker). |
| AA. Apical two segments of each tarsus brown; at least the vibrissæ and the vertical bristles blackish; first section of costa subequal to third and distinctly longer than second . . . . . . . . . . . . . . . . . . . . . . . . | [*hawaiiensis*, nov.<br>*elegantula*, var. |

### *elegantula*, typ. var.

Glossy black with a greenish or bluish tinge, not particularly conspicuous on the frontal triangle, the latter with a slight pimple-like elevation in centre about midway between ocelli and anterior margin; third antennal segment fuscous, with the lower third or less reddish yellow; aristæ equally as short pubescent as in the next preceding species. Thorax almost as in that species, but the scutellum is more flattened above, its apex is more rounded, and the lateral bristles are much shorter and closer to the apical pair. Veins 3 and 4 parallel apically, section of costa between their apices less than half as long as the one basad of it; fourth vein slightly flexed just beyond outer cross-vein. Legs in structure similar to those of *atrifrons*; the hind tibiæ in the only specimen before me with a very faint indication of a brown mark near base.

Length 2·5 mm.

*Locality.*—Manila, P.I. (*R. C. McGregor*). United States National Museum.

### *elegantula*, var. *hawaiiensis*, nov.

*Male.*—A larger insect than the preceding one, with the frontal triangle of the same form but more distinctly æneous, the armature and structure of the head very similar, but the scutellum is the same in structure as in *atrifrons*, with the lateral bristles about one-fifth as long as the apical pair, and the apex transverse between the latter bristles. The wings are also broader than in the variety described above, causing the cells to be wider in comparison with their length. The legs are also apparently longer.

Length 3·25 mm.

*Type* and one paratype, Waimea, Hawaii, 18.vi.1922 (*J. F. Illingworth*). United States National Museum.

### *Macrostyla affinis*, sp. n.

*Female.*—Very similar in structure to *hawaiiensis* and *atrifrons*, differing from both in the colour of the frontal triangle, which is largely violet-blue, and in its structure from both, the anterior portion having a slight central pimple-like elevation, immediately anterior to which there is a shallow rounded depression. The legs are coloured as in *atrifrons*, but the two dark segments of the hind tarsi are only brown, not deep black. The scutellum is similar to that of the last-mentioned species and the third antennal segment is orange-yellow, with a narrow dark upper margin. The first section of costa is the longest, the third and second are subequal, and the fourth is not half as long as third; veins 3 and 4 subparallel apically.

Length 3·25 mm.

*Type*, Pelaboean, Java (*Bryant & Palmer*). United States National Museum.

### *Macrostyla quadriseta* (de Meijere).

I have not seen this species, which ought to be readily distinguishable from any in this group by the armature of the scutellum.

### Group *tibiella*.

This group is distinguished from the preceding two by the structure of the scutellum, which is not longer than wide at base, rounded in outline, and convex on disc. In all the species available to me at this time the third wing-vein is distinctly bent forward apically, a character met with in several species in the other groups.

### *Key to the Species.*

| | | |
|---|---|---|
| 1. | Wing with a large black-brown apical spot; scutellum with four distinct bristles situated on elevated bases; legs yellow, hind tibiæ black-brown .............. | *meijerei* (Becker). |
| | Wings entirely hyaline ............... | 2. |
| 2. | Scutellum with four outstanding bristles .. | 3. |
| | Scutellum with but two outstanding bristles. | 4. |

3. Legs black, trochanters, a spot at knees, and the tarsi yellow; frontal triangle black, with a median sulcus; third antennal segment black-brown, basal two segments paler; wings short and broad .......... *latipennis* (de Meijere).

Legs yellow, fore coxæ and all femora except their apices black; frontal triangle glossy black, without a median sulcus; third antennal segment orange-yellow, basal two segments black .................. *varicornis*, sp. n.

4. Palpi red; no minute setulæ basad of the two long apical bristles; antennæ black-brown; legs black, trochanters, bases and apices of mid and hind tibiæ, and all tarsi except the fifth segment yellow.... *tibiella* (Becker).

Palpi black; scutellum with two long apical bristles, and close to these on basal side a very short setula; antennæ fuscous, third segment orange-yellow; legs black, trochanters, fore tibiæ, mid and hind tibiæ except their apices, and all of the tarsi yellow .......................... *africana*, sp. n.

### *Macrostyla meijerei* (Becker).

### *Macrostyla latipennis* (de Meijere).

### *Macrostyla tibiella* (Becker).

The above three species are unknown to me except from their descriptions.

### *Macrostyla varicornis*, sp. n.

*Female.*—Glossy black, with a very slight bronzy or æneous tinge. Frons dull black, the triangle highly polished and narrowly rounded on anterior margin of frons; basal two segments of antennæ black, third disc-like, orange-yellow; aristæ black, very distinctly pubescent; palpi black; cheeks practically invisible. Thorax with black hairs, mesonotum not as long as wide, with rather minute piliferous punctures; scutellum not as long as its basal width, more coarsely piliferous punctate than mesonotum, rounded in outline, not markedly convex above, the lateral bristles about half as long as the apical pair, the elevated bases very inconspicuous. Legs normal, yellow, only the coxæ and femora black. Wings hyaline, first costal division almost as long as third, the latter twice as long as second, the second slightly shorter than fourth; third vein distinctly bent forward, fourth ending almost in wing-tip, and almost entirely straight on apical section.

Length 1·5 mm.

*Type*, Mt. Maquiling, Luzon, P.I. (*C. F. Baker*). In author's collection.

### *Macrostyla africana*, sp. n.

Differs from the preceding species in being more glossy black, in having the triangle not metallic tinged, longer, and narrowly truncate at anterior extremity, the mesonotum and scutellum very regularly and finely piliferous punctate, the basal pair of scutellar bristles replaced by minute setulæ, the cheeks about half as high as width of third antennal segment, and the mid and hind tibiæ largely blackened basally. In the wing-venation there are also several differentiating characters, as follows:—The first section of the costa is distinctly longer than third, the second is very little shorter than third and just a trace longer than fourth, while the third vein is not as distinctly bent forward at apex.

Length 2 mm.?

*Type*, Salisbury, S. Rhodesia, 18.iv.1927 (*A. Cuthbertson*). To be deposited in British Museum.

The type lacks the abdomen, so that it is impossible to tell what sex it is and to give accurate length.

### Genus Epicelyphus, Becker.

This genus is another in which the sensory area is lacking on the hind tibia, and while it has the scutellum with wart-like elevations on the margin, which are armed at apices with distinct bristles, it differs from the preceding genus in having the shape of the scutellum quite different, this being narrowed at base and oval in general outline, with the disc quite prominently convex. The mesopleura is haired, the epistome is downy, and the first posterior cell of the wing is not widened at apex.

The three known species may be distinguished as below:—

#### *Key to the Species.*

1. Scutellum about twice as long as mesonotum and with 30–40 spines on each side; frontal triangle strongly and densely punctate; arista almost bare .................... *boettcheri*, Frey.

Scutellum with 7–8 spines on each side; frontal triangle not densely punctate...... 2.

2. Scutellum distinctly longer than the mesonotum, the spines not much longer at apex than at base; arista distinctly pubescent; frontal triangle impunctate; outer cross-vein of wing erect ...................... *principalis*, Becker.

Scutellum not as long as mesonotum, the basal spines on each side shortened, the apical pair over twice as long as the pair next to them; arista bare; outer cross-vein oblique, almost in continuous line with apical section of fourth vein; frontal triangle with a few rather large piliferous punctures on the sides and in front ...................... *philippinensis*, sp. n.

### *Epicelyphus philippinensis*, sp. n.

*Male.*—Glossy black, the antennæ and central portion of dorsum of abdomen more brownish; basal four segments of fore and mid tarsi and basal three segments of hind pair orange-yellow; wings slightly browned; knobs of halteres black.

Head broader than high; frons a little longer than its vertical width, narrowed in front, triangle glossy, extending to anterior margin, its apex almost acute, the sides and apex with some piliferous punctures; all verticals and postocellar bristles well developed, ocellars minute and fine; antennæ longer than in the preceding genus, slightly pendulous, third segment a little longer than wide, rounded at apex; arista bare. Mesonotum and scutellum deeply piliferous punctate, scutellum not two-thirds as long as mesonotum. First costal section longer than second, the latter about 1·5 as long as third, fourth about half as long as third; first posterior cell slightly narrowed apically. Other characters as in key, the hind femora unarmed ventrally.

Length 3·5 mm.

*Type* and one paratype, Mt. Maquiling, Luzon, P.I. (*C. F. Baker*).

United States National Museum.

## V.—*On* Troödon, *a Reply to Dr. C. W. Gilmore.*

By Dr. Francis, Baron Nopcsa.

In a most important paper, shedding a great deal of light on the classification of North American quadrupedal armoured Dinosaurs, Gilmore (1) makes the following statement:—"The inclusion of the genus *Troödon* in the Nodosauridæ by Nopcsa is so obviously in error that I take the opportunity to challenge the propriety of the assignment."

Taking up the challenge, I would like to make the following remarks. In 1882 Seeley described, under the name *Mochlodon*, from the Gosau (Austria), a mandible, fragments of the parietal, and a scapula, all belonging to the typical bipedal ornithopodous Dinosaur *Rhabdodon*. He described, subsequently, body-remains of three individuals of a heavily-armoured quadrupedal Dinosaur which he called *Cratæomus*, and, finally, the base of a skull that Bunzel in 1871 had called *Struthiosaurus*. Between 1896 and 1902 I discovered in Transsylvania numerous skull-remains and body-remains of *Rhabdodon*, and in 1902 I pointed out that *the skull-fragment of* Struthiosaurus *stands in the same relationship to the body of* Cratæomus *as the skull-fragment of* Acanthopholis *to the body of this heavily-armoured quadrupedal* Dinosaur. I concluded, therefore, that the remains called *Cratæomus* belong to the skull called *Struthiosaurus*, and indicate the existence of a type of armoured Dinosaur with equal fore and hind limbs and a small skull.

In 1912 I discovered at Szentpéterfalva, *in situ*, in an area not larger than one square yard, several bones belonging undoubtedly to *Cratæomus*, together with the greater part of a skull of *Struthiosaurus* and a very peculiar atlas fitting on the basioccipital condyle. These very characteristic pieces were: a posterior cervical, a dorsal and an anterior caudal vertebra, a rib, a scapula, and one piece of the dermal armour of the tail. All these pieces were described in 1929. Thus two independent discoveries, made several hundred miles apart, showed that *Cratæomus* and *Struthiosaurus* are but two names for one heavily-armoured Dinosaur allied to *Acanthopholis*. In my paper of 1929 (2) I pointed out further, in great detail, that the skull called *Struthiosaurus* is built essentially on the lines of *Troödon*, while the body called *Cratæomus* does not agree with the body of *Troödon* in any point. I concluded, therefore—and this seems to have escaped Gilmore's attention,—that his *Troödon* is an artificial mixture built up of the skull of a heavily-armoured quadrupedal and the body of an unarmoured bipedal Dinosaur. Further, I suggested that one of the so-called ventral ribs of *Troödon* might even be a fish-bone. Under such circumstances, of course, *Troödon* cannot enter into any systematic unit.

This conclusion, arrived at by different discoveries in different countries, can also be supported by logical argument. *It is against all the laws of correlation* that the skull of a bipedal ornithopodous Dinosaur should have become specialized on such an utterly non-ornithopodous line as did the skull of *Troödon* without the body having changed at least to some degree. If the body of *Troödon* were less typically ornithopodous, or the skull less similar to the skull of *Struthiosaurus*, one might assume, in a somewhat hazardous manner, that the modifications affecting the skull of this animal had not yet extended to the body; but the correlations existing between the cranial, cervical, and dorsal musculature make even such a hypothesis very risky. As the matter stands, the uniting of the skull of *Troödon* with the body included under this name seems to me to be much the same as trying to fix the head of an ox on the body of a horse, or, perhaps, even something worse, for the biology of these two animals is at least somewhat the same, while the biology of the *Troödon* skull differed, as is indicated by the structure of the teeth, essentially from that of all Ornithopoda, and, therefore, also from the body of *Troödon*.

The absence of a lateral flange on the ischium attributed to *Troödon* cannot be brought forward as an argument against the typically ornithopodous nature of the body-skeleton of this animal, for this flange is also missing in the typically ornithopodous *Rhabdodon*.

Putting this all together, it seems not improbable that the body-skeleton described as "*Troödon*" will in future have to receive a new generic name: the type-skull of *Troödon* has, however, to be entered among the Acanthopholinæ. Future discoveries may, perhaps, prove that the Acanthopholinæ (comprising *Acanthopholis*, *Hylæosaurus*, *Struthiosaurus*, and *Troödon*) are a unit equivalent to the Panoplosaurinæ and Ankylosaurinæ together, but at present such a classification seems premature.

Although ready to accept Gilmore's definitions of the Panoplosaurinæ and Ankylosaurinæ, and his proposal to omit the subfamily Nodosaurinæ, I nevertheless challenge him to prove that the skull of a vertebrate animal can be modified to such an extent as to change even the biology of the animal without the body of this animal being affected. As long as he cannot prove this, I continue to consider the animal he described as "*Troödon*" as a monster, as I did already in 1929, although it is true Gilmore never tried to refute this.

## *References.*

(1) Gilmore. 1930. "On Dinosaurian Reptiles from the Two Medicine Formation of Montana." Proc. U.S. Nat. Mus. vol. lxxvii. Art. 15, p. 31.

(2) Nopcsa. 1929. "Dinosaurierreste aus Siebenbürgen V." Geol. Hungarica, Ser. Palæont., Fasc. 4.

Vienna, Austria,

# VI.—*Some Suggestions on the Classification of the Genus* Tipula (*Diptera*, Tipulidæ). By F. W. EDWARDS.

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*TIPULA* is one of the largest genera of Diptera, with about a thousand described species occurring in all parts of the world except New Zealand, temperate Australia, and most of the smaller islands. In view of the immense number of species to be dealt with, various attempts have been made to divide the genus into species-groups or subgenera, but these have not been altogether successful, and have applied, in the main, to species of one region only. European writers have defined species-groups mainly on the pattern of the wings and thorax ; Alexander has arranged the American species into numerous groups defined partly on the colour-pattern and partly on the male hypopygium and antennæ. All these characters are open to objection as a basis for classification, either because of their trivial nature or as being applicable to one sex only. Hypopygial characters are no doubt valuable indices of natural affinities, but this organ is sometimes so differently constructed in closely related species that the significant features are not easy to appreciate.

In the hope of discovering some more satisfactory basis for the subdivision of the genus, I have made a rather close study of the British Museum Collection, which includes examples of about 360 species. The results of this scrutiny are somewhat disappointing, but are given here for what they are worth. I will first indicate some features which have been but little used hitherto, but are applicable to both sexes, and seem to me valuable for purposes of classification, and then proceed to discuss the applicability of the various published names which are or might be used as subgenera.

## I.—LITTLE-USED TAXONOMIC CHARACTERS, APPLICABLE TO BOTH SEXES.

1. *Length of Radial Sector.*—This is fairly constant through whole groups of species, although all intermediate lengths can be found between the long and short types. I find the most satisfactory way of defining the length of this vein is in terms of the length of the *m–cu* cross-vein ; this ratio can easily be estimated roughly by eye under a low-power lens. A "short" sector is about equal to *m–cu* ; a "long" sector about twice as long as *m–cu*.

2. *Shape of Discal Cell.*—This depends chiefly on the position of origin of the vein $M_4$, whether close to or even just before the base of the cell (as in the genus *Nephrotoma* = *Pachyrrhina*), or well removed from the base (as in most *Tipula*). Again all intermediate conditions occur, but some groups are constant in this respect. Usually when $M_4$ arises close to the base, the discal cell is long and parallel-sided.

3. *Presence or Absence of Macrotrichia on Veins at Tip of Wing.*—In some groups all the veins beyond the cord are hairy, in others the branches of the media, and sometimes also the cubitus, are bare. The hairs, when present, vary in length, and may require a fairly high magnification for their detection, but under a binocular their bases are visible as dark dots.

4. *Presence or Absence of Hairs on the Squama.*—In some groups a distinct tuft of hairs is present on the angle of the squama, in others there is no trace of these hairs. A few species are intermediate, with the hairs present but very short and inconspicuous.

5. *Number of Tibial Spurs.*—Normally the full number of spurs is present (formula 1. 2. 2), but in certain groups and species the middle tibia has only one spur (formula 1. 1. 2), and in one group the front tibia has no spur, and a short mid-tibial spur may be present or absent (formula 0. 0. 2 or 0. 1. 2). The spurs are rather easily broken off, and in ascertaining their number care must be taken to examine perfect specimens.

6. *Pubescence of Thorax.*—The pubescence on different parts of the thorax varies in amount in different species, but in too indefinite a manner to be of much use in taxonomy. One group is rather sharply marked off from the rest by the presence of anepisternal hairs, and the presence or absence of sternopleural hairs is sometimes noteworthy, though these hairs are of rather sporadic occurrence. For example, *T. cheethami*, Edw., has numerous sternopleural hairs, though the closely related *T. alpium*, Bergr., has few or none.

7. *Verticillate Hairs of Antennæ.*—In some groups these hairs are subequal in length, in others the hairs of the under surface are very much shorter than the dorsal hairs; the latter condition is found in those groups which approximate to the genus *Nephrotoma*.

## II.—PUBLISHED SYNONYMS AND SUBGENERA OF *TIPULA*.

In the following notes all the published synonyms and subgenera of *Tipula* are discussed, including two (*Tipulodina* and *Brithura*) which have sometimes been treated as distinct genera. Other closely related genera (such as *Longurio*, *Holorusia*, *Prionocera*, *Ctenacroscelis*) are not dealt with, as they are commonly accepted as distinct:—

1. *Tipula*, Linn., 1758 (type, *oleracea*, Linn.).—It is, perhaps, fitting that the species of the *oleracea* group should occupy a somewhat intermediate position between several other groups of the genus. They show the following characters: *Rs* moderately long (about 1·5 times *m–cu*). $M_4$ arising near middle of discal cell. Branches of *M* with a variable number of very short macrotrichia, sometimes almost bare. Squama with a very few short hairs, which may be present or absent even in the same species. Spurs 1. 2. 2. Claws of ♂ with basal tooth. Few or no sternopleural hairs. Hairs of under surface of flagellar segments rather long.

2. *Pterelachisus*, Rond., 1842 (type, *bertei*, Rond.).—Founded on a subapterous female with ovipositor of normal type. Until the male is certainly known the affinities of the sub-genotype cannot be decided; it is clearly a true *Tipula*, and may be related to *T. pagana*, Mg.

3. *Anomaloptera*, Lioy, 1864 (type, *nigra*, Lioy = *nigra*, Linn.).—*T. nigra* is a rather isolated species, probably deserving subgeneric rank, and showing quite as much affinity to *Nephrotoma* as to *Tipula*. *Rs* short, scarcely longer than *m–cu*. $M_4$ arising at base of discal cell. Cell $M_1$ often sessile (but variable, sometimes with short stalk). Branches of *M* bare or almost so, also *An*, but not tip of *Cu*. Squama quite bare. Spurs 1. 2. 2. Claws of ♂ simple. Antennæ inserted well above base of rostrum (as in *Nephrotoma*; in most *Tipula* the antennæ are inserted close to base of rostrum). The chief distinctions from *Nephrotoma* are the somewhat longer *Rs* (in *Nephrotoma* it is nearly always shorter than *m–cu*) and the bare branches of *M*.

4. *Oreomyza*, Pok., 1887 (type, *glacialis*, Pok.).—Founded solely on the possession of 15 segments in the male antenna instead of the usual 13. *Rs* moderately long; base of $M_4$ well beyond base of discal cell; all veins beyond cord sparsely setose; squama quite bare; spurs 1. 2. 2; claws of ♂ simple; no sternopleural hairs; ovipositor of the normal type, with slender cerci and long styli. The abnormal

antennæ of *T. glacialis* do not constitute a sufficient reason for recognizing *Oreomyza* as a distinct subgenus, and the other characters, apart from the marmorate wings, are much as in *Tipula*, s. str. If the group is recognized at all it might include the species of the *varipennis* and *marmorata* groups, which are essentially similar.

5. *Tipulodina*, End., 1911 (type, *magnicornis*, End.).—*Rs* very short, usually shorter than *m–cu*, rarely slightly longer; $M_4$ arising well beyond base of discal cell; all veins beyond cord quite bare; squama quite bare; $R_{4+5}$ more curved down than usual, ending below instead of at or above wing-tip as in most other *Tipula*; spurs normal in number (1.2.2), but very short; legs nearly always with white rings. This is a very well-marked group with numerous Oriental species; it has been treated as a distinct genus, but I should prefer to regard it as a subgenus of *Tipula* related to the *Acutipula* group.

6. *Trichotipula*, Alex., 1915 (type, *oropezoides*, Alex.).—*Rs* short, equalling *m–cu*; $M_4$ arising near base of discal cell; wing-tip with numerous hairs on membrane as well as on veins; cell $M_4$ deeper than usual, approximating to the condition found in *T. variicornis*, Schum., and related species; squama quite bare; spurs 1.2.2; no sternopleural hairs. Probably a valid subgenus; the general appearance is very suggestive of *Oropeza*, and the two groups may be more nearly related than has been supposed.

7. *Cinctotipula*, Alex., 1915 (type, *algonquin*, Alex.).—Characters practically as in *Trichotipula*, under which subgenus *T. algonquin* and related species should be included. *Cinctotipula* was based on the lengthened antennæ of the male, an unimportant feature.

8. *Brithura*, Edw., 1916 (type, *conifrons*, Edw. = *imperfecta*, Brun.).—Founded on the presence of vein $Sc_1$, a very unusual feature in this subfamily. Although proposed as a distinct genus, it is, perhaps, better regarded as a subgenus of *Tipula*. *Rs* hardly longer than *m–cu*; $M_4$ arising near middle of discal cell; branches of *M* and *Cu* bare; squama with a patch of short hairs; spurs 1.1.2; dorso-central hairs of thorax more numerous than usual, and sternopleural hairs also numerous, but no anepisternal hairs. Only two species are certainly referable here; *T. pulcherrima*, Brun., and related species were placed in *Brithura* by Alexander, but, as noted below, they belong rather to *Nippotipula*.

9. *Nippotipula*, Mats., 1916 (type, *nubifera*, Coq.).—As in the case of the other generic names introduced by Matsumura, no adequate reasons were given for the separation from *Tipula*, but *T. nubifera* possesses some very distinctive features which are certainly of subgeneric, if not generic, value. *Rs* long, at least twice as long as *m–cu* ; $M_4$ arising near or beyond middle of discal cell, and *m–cu* meeting discal cell before base of $M_4$ (very unusual in *Tipula*) ; few or no hairs on branches of *M* (except $M_1$) ; squama with a patch of short hairs ; spurs 1. 2. 2 ; dorso-central hairs of thorax numerous, in 3–4 irregular rows ; sternopleural hairs numerous ; anepisternal hairs present and fairly numerous (a unique feature of this group) ; markings of scutum of unusual type, each dark area being divided into two. In addition to *T. nubifera*, this group includes the North American *T. abdominalis*, Say, and the Oriental *T. pulcherrima*, Brun., *T. anastomosa*, Edw., and *Brithura phædina*, Alex., all of which resemble the genotype in all important respects. Alexander has associated *T. cravieri*, Bell., and related South American species with *T. abdominalis*, but these belong, in my opinion, to quite another group.

10. *Formotipula*, Mats., 1916 (type, *holoserica*, Mats.).—*Rs* short or of moderate length (1–1·5 times *m–cu*) ; $M_4$ arising near middle of discal cell ; hairs on branches of *M* usually very few or absent (but occasionally quite numerous) ; squama quite bare ; spurs 1. 1. 2 (in all species examined, including *T. holoserica*) ; claws of ♂ toothed ; thorax nearly bare and uniformly dull black or red ; abdomen short, ovipositor always short and fleshy. This is rather a distinct group, which might be admitted as a subgenus ; in addition to the subgenotype, the following Oriental species are represented in the British Museum : *cinereifrons*, de Meij., *hypopygialis*, Alex., *lipophleps*, Edw., *melanomera*, Walk., *melanopyga*, Edw., *rufiventris*, Brun., *rufizona*, Edw., and some undescribed species.

11. *Yamatotipula*, Mats., 1916 (type, *nohiræ*, Mats.=*nova*, Walk.).—*Rs* long (nearly twice *m–cu*) ; $M_4$ arising close to base of discal cell ; branches of *M* more or less setose ; squama bare ; tibial spurs (in typical species) 1. 1. 2 ; claws of ♂ toothed ; sternopleural hairs absent, flagellum short-haired beneath ; wings more or less vittate. This group differs from *Tipula*, s. str., chiefly in the more basal position of *m–cu*. The absence of one of the mid-tibial spurs is not constant throughout the group : *T. nova* and the related Japanese *T. aino*, Alex., have only one mid-tibial spur, but

*T. caloptera*, Lw., and *T. eluta*, Lw., which are evidently nearly related, have the normal number of two spurs, and in *T. tricolor*, Lw., another member of the same group, some specimens have two mid-tibial spurs and some only one. I the group is recognized as a subgenus it might include the European species allied to *T. lateralis*, Mg., but no precise definition can be given.

12. *Platytipula*, Mats., 1916 (type, *moiwana*, Mats.).—*Rs* moderately long; $M_4$ arising well beyond base of discal cell; branches of *M* setose; squama bare; spurs 1.2.2; claws of ♂ toothed; flagellum long-haired beneath. There seems to be no important distinction between this and *Tipula*, s. str.

13. *Togotipula*, Mats., 1916 (type, *pulverosa*, Mats.).—I am indebted to Prof. C. P. Alexander for a specimen of *T. pulverosa*, which, as he points out, is not a *Tipula*, but is closely related to *Longurio fulvus*, Edw., and *L. rubriceps*, Edw. In all these species, it may be noted, the tibial spurs are absent or very minute (not more than one-third as long as the tibial diameter), and the squama is bare. The New Zealand species which I have referred to *Longurio* (*L. dux*, Hudson, and *L. legatus*, Edw., since placed in the genus *Austrotipula* by Alexander) have well-developed tibial spurs and a tuft of hairs on the squama. I am not acquainted with *L. testaceus*, Lw. (genotype of *Longurio*); it will be of interest to ascertain whether it shows more resemblance to the Oriental or to the New Zealand species in regard to the two characters mentioned. In the latter case *Togotipula* might be recognized as a distinct subgenus of *Longurio*.

14. *Odontotipula*, Alex., 1919 (type, *unifasciata*, Lw.).—*Rs* short (about equal to *m–cu* or slightly less); $M_4$ arising at base of discal cell; wing-membrane slightly hairy at tip; cell $M_4$ deep; squama quite bare; spurs normal (?); no sterno-pleural hairs. This does not appear to differ from *Trichotipula* in any important feature; the shining yellowish body is hardly a sufficient distinction.

15. *Nesotipula*, Alex., 1921 (type, *pribilovia*, Alex.).—Based chiefly on the reduction of the media, only two branches reaching the margin (cell $M_1$ absent); this may be connected with the reduction of the wings of the female, and, until the male is known, the subgenus cannot be adequately defined. *Rs* "equal to $R_{1+2}$"; *m–cu* at or before fork of *M*; legs short, tarsi shorter than tibiæ; ovipositor with "tergal valves greatly exceeding the relatively short sternal valves."

16. *Acutipula*, Alex., 1924 (type, *gaboonensis*, Alex.).—*Rs* short (about equal to *m–cu* or slightly longer); $M_4$ arising near middle of discal cell; $R_2$ always present and very oblique; $R_{4+5}$ ending in wing-tip; branches of *M* and *Cu* bare; squama bare; spurs 1. 2. 2, those on middle tibia equal and well developed; claws of ♂ toothed; pleuræ bare. In introducing the name *Acutipula*, Alexander laid stress on the toothed claws of the male and the pointed cell $R_2$, but there is nothing distinctive in either of these characters; most species of *Tipula*, including those of the *oleracea* group, have toothed claws in the male. I believe, nevertheless, that *Acutipula* might be recognized as a subgenus, chiefly on the short *Rs* and bare veins. The numerous plain-winged African species referred here by Alexander evidently form a natural group which may be known as the *pomposa*-group, *T. pomposa*, Bergr., being the first described species. The rather numerous European and Oriental species related to *T. maxima*, Poda, and *T. fulvipennis*, DeG., are essentially similar, and should, in my opinion, be referred to *Acutipula*; these may be known as the *fulvipennis*-group, which would include *T. maxima*, Poda, and its allies (*T. triangulifera*, Lw., *T. corsica*, Pierre, etc.), as well as *T. fulvipennis*, DeG., and its allies (*T. shirakii*, Edw., *T. princeps*, Brun., *T. robusta*, Brun., *T. fumifascipennis*, Brun., *T. interrupta*, Brun., *T. atuntzuensis*, Edw., &c.). All these are characterized by possessing a dark spot in the middle of cell *Cu*. In *T. princeps*, Brun., and *T. demeijerei*, Edw., the squama possesses a few short hairs, and the latter also differs from other members of the group in having setæ on the branches of *M*, but, nevertheless, seems to belong here. Some Oriental species referred here by Alexander are better placed in a new subgenus, as stated below.

17. *Vestiplex*, Bezzi, 1924 (type, *cisalpina*, Riedel).—Founded chiefly on the reduction of the halteres, as well as the wings, of the female, the male of the sub-genotype having normal wings and halteres. Reduction of the wings occurs in a number of unrelated species of *Tipula*, and cannot be regarded as a subgeneric character; the reduction of the halteres also in one sex is merely an accentuation of this tendency. I am indebted to Herr M. P. Riedel for the loan of specimens of *T. cisalpina*, and also of the related *T. hemapterandra*, Bezzi, and note the following characters as common to both: *Rs* long (fully 1·5 times *m–cu*), with dark spot at base; $R_2$ long; $M_4$ arising near middle of discal cell; squama quite bare; branches of *M* with short

macrotrichia; spurs 1.2.2; claws of ♂ simple; pleuræ bare; nasus absent; ovipositor with the cerci very strong and thick, horizontally placed, with the external edge serrate, styli rudimentary or absent. All the above characters, and especially the remarkably specialized structure of the ovipositor, are found in the species of the *arctica* group, and it seems to me that the subgeneric name *Vestiplex* might well be used to designate this group. Although the group is not very easy to define in the male sex, the characters noted above will assist in its recognition. A few species (e.g., *T. scripta*, Mg., *T. himalayensis*, Brun., &c.) have a well-developed nasus, but otherwise the diagnosis will apply, and certain details of coloration are also common to most of the species—*e.g.*, the marmorate or submarmorate wings and the tendency of the præscutal stripes to have narrow dark margins. The form of the male antennæ is very variable, but is certainly of small importance; in the subgenotype they are short and thick, with extremely short verticils, while at the other extreme is *T. excisa*, Schum., with its long serrate antennæ. (It may be remarked that *T. subexcisa*, Lundst., in which the male antennæ are similar to those of *T. excisa*, does not belong to this group.) The following species belong to *Vestiplex* in the sense here defined, and have been examined by me:—Palæarctic Region: *excisa*, Schum., *intermixta*, Ried., *nubeculosa*, Mg., *pallidicosta*, Pierre, *rubripes*, Schum., *scripta*, Mg. Oriental Region: *biserra*, Edw., *himalayensis*, Brun., *inequidentata*, Alex., *nigroapicalis*, Brun., *reposita*, Walk., *scandens*, Edw., *subscripta*, Edw. Nearctic Region: *arctica*, Curt. (=*glomerata*, Walk.), *platymera*, Walk. (=*labradorica*, Alex.).

## III.—PROPOSED NEW SUBGENERA.

In addition to those described above, a few other groups of *Tipula*, for which no subgeneric names are at present available, appear sufficiently distinct to deserve recognition as subgenera:—

1. *Schummelia*, subgen. nov. (type, *variicornis*, Schum.).—Rather well distinguished from most other subgenera by the shape of cell $M_4$, which is unusually deep and much wider at base than on margin; *m–cu* is very oblique (usually near the base of the small discal cell), and the distal portion of *Cu* continues the direction of the basal portion, instead of forming a slight angle with it as in nearly all other *Tipula*. Additional characters found in most or all of the species are: *Rs* short (not or scarcely longer than *m–cu*); $R_2$ always

of hairs; all veins beyond cord distinctly setose; cell $M_1$ often with very short stalk or even sessile; spurs 1.2.2 (rarely 1.1.2); flagellum short-haired beneath; nasus usually short. Two groups of species may be recognized: the *variicornis*-group (including *variicornis*, Schum.; *zonaria*, Goet., *yerburyi*, Edw., *butzi*, Edw., *robinsoni*, Edw., *klossi*, Edw., *pumila*, de Meij., *insulicola*, Alex., *hermannia*, Alex., and *annulicornis*, Say), with claws of male simple and ninth tergite with compressed median projection; and the *continuata*-group (including the Oriental *continuata*, Brun., *nipponensis*, Alex., *cylindrostylata*, Alex., *xanthopleura*, Edw., *hampsoni*, Edw., *sessilis*, Edw., *chumbiensis*, Edw., etc.), with toothed male claws and median projection of ninth tergite reduced or bent inwards so that the tergite appears to have a large V-shaped median excavation. A somewhat similar venation is possessed by the subgenus *Trichotipula*, Alex., which differs in the conspicuously hairy wing-tip and bare squama.

2. *Indotipula*, subgen. nov. (type, *walkeri*, Brun. = *tenuipes*, Brun. = *fulvipennis*, Walk.).—Distinguished from all other subgenera by the spur-formula, which is 0.0.2 or 0.1.2; the mid-tibial spur, even when present, is minute, and the outer spur on the hind tibia is shorter than the inner. *Rs* short, often shorter than *m–cu*; cell $R_2$ narrow; no distinct anal angle to wing, the axillary area being much reduced in size, and *Ax* running parallel and close to the hind margin; veins beyond cord usually devoid of macrotrichia; squama quite bare; claws of ♂ toothed; pleuræ bare. This is almost exclusively an Oriental group, a few species extending into the tropical parts of the Australasian region. It has some points in common with the subgenus *Acutipula*, and several of the species have been referred to that subgenus by Alexander, but the two subgenera are quite sharply separable. The following species are represented in the British Museum collection: *demarcata*, Brun., *divisa*, Brun., *elegantula*, Brun., *korinchiensis*, Edw., *sulaica*, Walk., *vilis*, Walk. In addition to these, the descriptions of the following indicate that they are to be placed in *Indotipula*: *gedehicola*, Alex., *riverai*, Alex., *fuscoangustata*, Alex.

3. *Lunatipula*, subgen. nov. (type, *lunata*, L. = *ochracea*, Mg.).—*Rs* of moderate length, 1·5 times as long as *m–cu* or more; $R_2$ complete and long, cell $R_2$ not specially narrow; anal angle of wing well developed as usual; veins beyond cord with numerous macrotrichia; squama with a distinct tuft of longish hairs at the angle; spurs 1.2.2; claws of ♂

toothed; pleuræ usually bare. This includes most of the European and North American species with unicolorous or subunicolorous wings, such as the following:—Palæarctic Region: *affinis*, Schum., *annulicornuta*, Alex., *brevispina*, Pierre, *bullata*, Lw., *cava*, Riedel, *fascipennis*, Mg., *helvola*, Lw., *limitata*, Schum., *livida*, v. d. W., *mellea*, Schum., *peliostigma*, Schum., *pustulata*, Pierre, *plagiotoma*, Alex., *selene*, Mg., *selenitica*, Schum., *trispinosa*, Lundst. Nearctic Region: *bicornis*, Forbes, *duplex*, Walk. (=*mingwe*, Alex.), *filipes*, Walk., *flavibasis*, Alex., *flavumbrosa*, Alex., *mallochi*, Alex., *morrisoni*, Alex., *submaculata*, Lw., *translucida*, Doane, *triplex*, Walk. (=*umbrosa*, Lw.), *valida*, Lw. Among plain-winged European species which do *not* belong here may be noted *flavolineata*, Mg., and *juncea*, Mg., which have the squama bare and veins beyond cord almost or quite bare; the former also has the spur-formula 1.1.2.

4. *Bellardina*, subgen. nov. (type, *cravieri*, Bellardi).—*Rs* short, about equal to *m–cu* or very little longer; *Rs* and $R_{4+5}$ usually wavy; often approximated in middle; veins beyond cord bare; squama with a group of short hairs; spurs 1.1.2; pleuræ bare; wing-markings of rather distinctive type. This is a purely neotropical group, including, in addition to the sub-genotype, *T. theobromina*, Edw., and some other related species, four of which (undetermined) are represented in the British Museum Collection.

## VII.—*Description of a new Species of* Oligota (*Col.*, Staphylinidæ) *from Trinidad.* By MALCOLM CAMERON, M.B., R.N., F.E.S.

### *Oligota* (*Holobus*) *minuta*, sp. n.

Minute, convex, black, shining, the apex of the abdomen scarcely pitchy. Antennæ yellow, with 3-jointed club. Legs yellow. Length ·6 mm. Build of *flavicornis*, Lac., but much smaller, the head and thorax more finely and more sparingly punctured; the elytra much more finely and much less closely punctured, the sculpture less distinctly squamous; the abdomen more finely and less closely punctured, the eighth and ninth joints of the antennæ a little less transverse. From *centralis*, Shp., it also differs in the smaller size, finer and more sparing puncturation, and paler legs.

Trinidad: Huevos. Predacious on a *Cassava* mite (*Urich* Feb. 1928).

# VIII.—*Silurian Corals.—The Genera* Xiphelasma, *gen. nov.*, *and* Acervularia, *Schweigger, with Special Reference to* Tubiporites tubulatus, *Schlotheim, and* Diplophyllum cæspitosum, *Hall.* By STANLEY SMITH, M.A., D.Sc., F.G.S., and W. D. LANG, M.A., Sc.D., F.R.S., F.G.S.

[Plates II. & III.]

## I.—INTRODUCTION.

Through the kindness of Dr. W. O. Dietrich, of the Geologisch-Paläontologisches Institut und Museum (Naturkunde Museum), Berlin, and Dr. R. S. Bassler, of the United States National Museum, Washington, we have been able to examine type-material of *Tubiporites tubulatus*, Schlotheim, and *Diplophyllum cæspitosum*, Hall.

Since both species have been frequently misinterpreted, it is thought desirable to publish a brief account of the types and figures of sections cut from the material.

*Tubiporites tubulatus* is closely allied to species of *Tryplasma*, Lonsdale, but is sufficiently differentiated from them to warrant its being placed in a separate genus, for which we propose the name *Xiphelasma.*

*Diplophyllum cæspitosum* is simply a diphymorphic species of Schweigger's genus *Acervularia.*

In considering *Acervularia cæspitosa* (Hall) it is necessary to consider also the genotype and other species of *Acervularia*, and thus an excellent opportunity arises of describing certain structures which we have observed in species of *Acervularia*, and which we believe to be tertiary septa. In most cases these are only feebly represented, but in the new species described on p. 89 they are well developed. If we are correct in our interpretation of these structures *Acervularia* anticipates the cyclic method of septal insertion exhibited in Aporose corals, just as *Calostylis* and its allies anticipate in their perforate tissue the perforate species of the younger groups of Zoantharians.

The subject of this paper falls under two headings: I. *Xiphelasma*, and II. *Acervularia.*

Our best thanks are due to Dr. R. S. Bassler, Prof. W. O. Dietrich, Dr. J. E. Hede, Dr. E. M. Kindle, and Prof. Erik Stensiö for the gift or loan of material, and generally for encouragement in our work and for help readily rendered.

## I. XIPHELASMA, gen. nov.

(*Xiphelasma*: ξίφος, a sword, ἔλασμα, a plate, *i. e.*, septum.)

*Genotype.*—*Tubiporites tubulatus*, Schlotheim, 1813, p. 37. Silurian, Sweden [Gotland].

*Diagnosis.*—Rugose Corals with spinose septa, complete tabulæ, and large dissepiments separating the septa from their bases.

*Remarks.*—*Xiphelasma* is proposed for Rugose Corals with spinose septa and horizontal tabulæ, as in *Tryplasma*, but differing from *Tryplasma* in having dissepiments. The genus is only known to us by its genotype, which is cerioid in habit.

## TRYPLASMA.

*Tryplasma*, Lonsdale, 1845, p. 613.

*Genotype* (*Genolectotype*).—*T. æquabile*, Lonsdale, 1845, pp. 613, 633, pl. A, figs. 7, 7 *a*. Silurian, River Kakva, near Bogoslovsk, Urals. (See Lang & Smith, 1927, p. 461.)

*Diagnosis.*—Simple and compound Rugose Corals, varying much in shape and habit, with spinose septa, complete tabulæ, no dissepiments, and a more or less developed stereozone.

## *Xiphelasma tubulatum.* (Pl. II. figs. 1–5.)

*Tubiporites tubulatus*, Schlotheim, 1813, p. 37.

*Tubiporites subulatus*, Schlotheim, 1820, p. 368. Clearly a misprint for "*tubulatus*," as pointed out by Lindström (1883, p. 64).

*Pholidophyllum tubulatum*, Schlotheim (partim); Lindström, 1883, p. 64, excluding the rest of the synonymy and the description, which refers to *Tryplasma loveni* (Edwards & Haime, 1851, p. 364; 1854, p. 280, pl. lxvi. figs. 2, 2 *a*). It is most inexplicable that so careful and observant a worker as Lindström, who examined the type, should have regarded Schlotheim's species as identical with the form he is describing in this paper.

*Diagnosis.*—Cerioid or sub-cerioid *Xiphelasma*. Otherwise as for genus.

*Description* (entirely based on holotype).—The corallum is slightly sub-cerioid, for, although the corallites are in most part contiguous and prismatic, they are not everywhere in contact, and the prisms may then have the corners rounded off. The character of the calice is not known.

The corallites are about 4 mm. in diameter and have about forty short spinose septa, which are separated from the epitheca by large dissepiments. Seen in longitudinal section the septal spines are slender and directed distally, but at a low angle; about fifteen were counted in a distance of 5 mm.

The tabulæ, most of which are complete, are horizontally disposed, but may be flat or sagging. The dissepiments are relatively large, and form only a single series.

*Notes on Holotype.*—The holotype is a light, creamy, or rather yellowish, water- or ice-worn piece of coral, 8 cm. × 3 cm. in length and breadth, and 5 cm. high, consisting of a cluster of straight sub-basaltiform corallites. Two small fragments had been broken off one end of the specimen, and these were kindly lent to us by Dr. W. O. Dietrich for examination.

Lindström, according to an accompanying label, had also borrowed these, and cut thin sections from them, but, on account of the balsam having become discoloured with age, no structures could be satisfactorily determined in Lindström's slides.

The label reads "Diese stücke hat Lindström in Wisby gehabt, die dunnschliffe gefertigt und beiliegende Bestimmungen gegeben. Die Stücke stammen aus der Schloth. Sig. und gehoren zu nebenliegenden Stück." Another label, in Lindström's handwriting, reads "*Tubiporites nodosum* Schlotheim, *Tubip. tubulatus* Schlöth. von Gotland. Wahrscheinlich *Sarcinula auleticon* Goldf. ist eine varietät von dem auf Gotland überaus haufingen *Pholidophyllum Loveni* Edw. H."

## II. ACERVULARIA.

*Acervularia*, Schweigger, 1819, table vi.

*Genotype.*—*Acervularia baltica*, Schweigger, 1819, table vi=*Madrepora ananas*, Linnæus, 1758, p. 797—*Madrepora composita . . . centro-concava*, Linnæus, 1745, p. 21, fig. ix. n. 2. Silurian, Salopian, Gotland.

*Diagnosis.*—Phaceloid and cerioid Rugose Corals, in which gemmation is typically axial, parricidal, and quadripartite, and in which there is always a distinct inner wall or aulos, dividing the tabulæ into an inner and outer series. Typically the tabulæ of the inner series are small, arched, resemble dissepiments, and slope towards the axis; the outer tabulæ are flat and horizontal.

The septa dilate at the aulos, and, whilst the minor septa terminate just within this wall, the major extend to the axis; dissepiments form but a narrow border of small strongly arched vesicles.

*Remarks.*—This diagnosis, although differently worded, is essentially the same as our previous diagnosis of the genus (1927, p. 451), but contains one important emendation, namely, our statement concerning the nature of the aulos. Previously we implied that this was merely formed through the union of the dilated parts of the septa by stereom. Here we would stress that it may be primary tissue which joins the septa, so as to form the wall.

While our diagnosis is strictly based upon the genotype, there are other species of *Acervularia* which differ considerably from *A. ananas* in growth-habit, gemmation, and details of structure. These forms are, however, linked up with the typical *A. ananas* by a series of intermediate forms.

## DIPLOPHYLLUM.

*Diplophyllum*, J. Hall, 1851, p. 399; 1852, p. 115.

*Genotype.—D. cæspitosum*, Hall, 1851, p. 399; 1852, p. 116, pl. xxxiii. figs. 1 *a–r*. Lower part of Niagara Limestone, Lockport, and other places in the State of New York, U.S.A.

The genotype of *Diplophyllum* is a diphymorphic *Acervularia*, closely approaching the phaceloid *A. conglomerata* (Wedekind) (1927, p. 44, pl. iv. fig. 15) in habit and the cerioid *A. breviseptata*, Weissermel (1894, p. 608, pl. xlix. fig. 425), in internal structure. It is clear then that *Diplophyllum* is a genomorph * of *Acervularia*, and therefore a synonym of it. The genomorphic name can, however, be used for such diphymorphs of *Acervularia*. If the name *Diplophyllum* is used in this sense, the three known species should by written thus :—

*Acervularia* {*Diplophyllum*} *cæspitosa* (Hall).
*Acervularia* {*Diplophyllum*} *conglomerata* (Wedekind).
*Acervularia* {*Diplophyllum*} *breviseptata*, Weissermel.

## RHABDOPHYLLUM.

*Rhabdophyllum*, R. Wedekind, 1927, pp. 14, 42.

*Genosyntypes* :—

*Rhabdophyllum truncatum* (Linnæus), Wedekind, 1927, p. 43. Upper Silurian, "Horizon III., Hedströms," Kopparsvik, Gelgberget, u.s.w. Gotland = (Wedekind judic) *Madrepora* . . . *cylindraceo-concavis*, Linnæus, 1745, pl. 21, fig. x. n. 3 = *Caryophyllia explanata*, Hisinger, 1831, p. 128, pl. viii. fig. 9 ; 1837, p. 101, pl. xxviii. fig. 13, which is *Kodonophyllum truncatum* (Linnæus) ; see Smith & Tremberth, 1929, p. 369.

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* Lang & Smith, 1930, p. 179.

*Rhabdophyllum excavatum*, Wedekind, 1927, p. 43, pl. iv. fig. 16. Upper Silurian, " Horizon III., Hedströms," Irevik, Snipklint, Gotland.

*Rhabdophyllum elongatum*, Wedekind, 1927, p. 44. Upper Silurian, " Horizon III., Hedströms," Galgberget bei Visby, Gotland=(Wedekind judic) *Caryophyllia truncata*, Hisinger, 1837, p. 101, pl. xxviii. fig. 14, which is *Acervularia ananas*, var. *truncata*, Wahlenberg.

*Rhabdophyllum striatum*, Wedekind, 1927, p. 44, pl. iv. figs. 13 & 14. Upper Silurian, " Horizon III., Hedströms," Lickershamn and Högklint, Gotland.

*Rhabdophyllum cylindricum*, Wedekind, 1927, p. 44, pl. iv. figs. 9–12. Upper Silurian, " Riffkalk, Horizon III., Hedströms," Högklint, Gotland.

*Rhabdophyllum conglomeratum*, Wedekind, 1927, p. 44, pl. iv. fig. 15. Upper Silurian, "Riffkalk, Horizon III., Hedströms," Högklint, Gotland.

*Genolectotype* :—

*Rhabdophyllum excavatum*. Here chosen.

*Remarks*.—The genus *Rhabdophyllum* embraces forms allied to *Acervularia ananas*, Linnæus. Wedekind also included *Caryophyllia explanata*, Hisinger, but we believe that he misinterpreted Hisinger's species, which has not the structure of the rest of Wedekind's forms of *Rhabdophyllum*, but is his *Kodonophyllum milne-edwardsi*=*Kodonophyllum truncatum* (Linnæus). It is clear that, if *Rhabdophyllum truncatum* were chosen as lectotype, *Rhabdophyllum* would become a synonym of *Kodonophyllum*; if any of the other genosyntypes except *R. excavatum* were chosen, *Rhabdophyllum* would become a synonym of *Acervularia*. As genolectotype, therefore, we choose *R. excavatum*, whose characters, however, are insufficiently described and figured for complete understanding.

## *Species of* Acervularia.

Here we simply give, as briefly as possible, particulars of those species of *Acervularia* we have actually examined in the course of our work on Silurian corals. More detailed descriptions are deferred to a future occasion. Although brief, our summary emphasizes the more important characters of the corals, demonstrates the wide range of variation in habit and structure found within a single lineage, and shows how these markedly different forms are yet linked together.

### *Acervularia ananas* (Linnæus). (Pl. II. fig. 14; Pl. III. figs. 1–3.)

### *Acervularia ananas*, var. *ananas* (Linnæus).

*Madrepora composita . . . centro-concava*, Linnæus, 1745, p. 21, fig ix. n 2
*Madrepora ananas*, Linnæus, 1758, p. 797.
*Acervularia baltica*, Schweigger, 1819, table vi.

*Diagnosis.*—Large cerioid *Acervularia* which have all the characters mentioned in the diagnosis as typical of the genus.

*Remarks.*—The form is common in the Salopian of Gotland (=Wenlock and Lower Ludlow) and England (Wenlock Limestone). The corallites attain a diameter of 15 mm. and sometimes more, and have about sixty septa, of which the major typically reach the axis, where they are usually twisted. Carinæ may be present in this and in the other varieties of *A. ananas*, and, in fact, in most other species of *Acervularia*; but, generally speaking, they are only feebly developed.

### *Acervularia ananas* (Linnæus), var. *truncata* (Wahlenberg).

*Madreporites truncatus*, Wahlenberg, 1819, p. 97.
*Acervularia ananas* (Linnæus), var. *truncatum* (Wahlenberg), Lang & Smith, 1927, pp. 463, 474, pl. xxxv. figs. 6, 7, & 8.

*Diagnosis.*—Large phaceloid *Acervularia ananas* resembling the cerioid form in every way except in growth-habit.

*Remarks.*—This variety occurs at the same general horizon and locality as *A. ananas*, var. *ananas*.

### *Acervularia ananas*, var. *singularis*, Lang & Smith, 1927, p. 463.

*Madrepora composita . . . centro-concava*; . . . *Varietatem sat singularem sistit* fig. viii. Linnæus, 1745, p. 21, fig. viii.
*Acervularia ananas* (Linnæus), var. *singularis*, Lang & Smith, 1927, p. 463.

*Diagnosis.*—Cerioid *Acervularia* with smaller corallites than *A. ananas*, var. *ananas*, and simpler, although similar, internal structures. The septa are shorter and straighter, the inner tabulæ fewer and relatively larger, and the dissepiments are not always present.

*Remarks.*—The corallites in *Acervularia ananas*, var. *singularis*, average 10 mm. in diameter and have about forty septa. This smaller variety grades into *A. ananas*, var. *ananas*, and a large proportion of specimens of *Acervularia ananas* fall between the two varieties. On the other hand, by a series of intermediate forms *A. ananas*, var. *singularis*, grades into the diphymorphic *Acervularia breviseptata*, Weissermel, which, were it not for the perfect series of passage-forms, would be hardly thought to belong to the same genus as the genotype. *A. ananas*, var. *singularis*, is found at the same horizon and same localities as the larger forms.

### *Acervularia densa*, sp. n. (Pl. III. fig. 5.)

*Diagnosis.*—Small phaceloid *Acervularia* with strongly dilated and highly carinate septa and much interstitial stereome. All other structures are similar to *A. ananas*, but not so well developed. Dissepiments are to a great extent suppressed. Gemmation is typically marginal and non-parricidal.

*Description and Remarks.*—*A. densa* resembles in many respects *A. ananas*, var. *truncata*, but has much smaller corallites, which in the holotype average 7 mm. in diameter. The tissues are much masked, and somewhat modified, by stereome. The septa are thickened throughout and the localized dilatation characteristic of the genus is much more extended than in other species.

*Horizon and Locality.*—Lower Salopian, horizon "*f*" of Lindström. Hallshuk, in the Parish of Hall, North Gotland.

*Holotype.*—British Museum specimen R. 24353. Only specimen known to us.

*Note.*—The possibility that this form is merely a pathological modication of *A. ananas* must not be overlooked, although we consider it is much more probable that it represents a true species.

### *Acervularia exigua*, sp. n. (Pl. III. figs. 6–8.)

*Cyathophyllum cæspitosum*, Goldfuss, partim, Hisinger, 1831, p. 129.

The holotype of *Acervularia exigua* is one of two corals identified by Hisinger with Goldfuss's Devonian species. The other coral is a *Tryplasma.*

*Diagnosis.*—Sub-cerioid *Acervularia*, with long thin septa which hardly dilate at the aulos, but often twist, run irregularly, and terminate unevenly; with inner tabulæ, of which some are complete and deeply concave, and others small and incomplete; with outer tabulæ as in other forms of *Acervularia*, but not everywhere differentiated from the dissepiments, since these may abut against them or be continuous with them, forming S-shaped plates. Gemmation is axial and parricidal.

*Description and Remarks.*—This species of *Acervularia* has been found so far only on the island of Lilla Karlsö, Gotland. The corallum includes cylindrical and prismatic corallites 10 to 12·5 mm. in diameter, and having about forty septa (major and minor).

Whilst the structures of *A. exigua*, although less well developed, agree on the whole with those of *A. ananas*, the form has some features of more than usual interest. The major and minor septa may be well differentiated or nearly equal in length. The aulos is perfectly formed, but is inconspicuous in transverse section. The inner tabulæ are usually small and incomplete, but in some corallites most of them are complete.

The relationship of the outer tabulæ and dissepiments (see diagnosis) suggests more pointedly perhaps than in any of the preceding forms that the former originate from the dissepiments, and are therefore dissepimental rather than tabular in the stricter sense.

The most interesting feature, however, is the intercalation of short septa-like lamellæ between the major and minor septa at both the periphery of the coral and to some extent also at the aulos. These look exactly like short minor septa, and, but for the fact that minor septa are already present, would be accepted as such without any hesitation. They recall the minor septa in some forms of *Lonsdaleia*. The same structures, but in a very rudimentary condition, are also to be found in other species of *Acervularia*, e.g., *A. ananas*, var. *singularis*, *A. conglomerata*, and even as faint traces in *A. ananas*, var. *ananas*, itself. In *A. exigua* these supplementary septa, although short, are well developed. They regularly alternate with the ordinary septa, except that in one or two places two of them have been observed within the same interseptal space. In some corallites, however, they are rudimentary or altogether absent.

*Horizon and Locality.*—(Salopian) Lilla Karlsö, Gotland.

*Holotype.*—Riksmuseet, Stockholm (Hisinger Collection).

*Paratype.*—British Museum R. 29100 and R. 29209, collected and presented by Dr. J. Ernhold Hede, of the Swedish Geological Survey.

*Acervularia conglomerata* (Wedekind). (Pl. II. figs. 11–13.)

*Rhabdophyllum conglomeratum*, Wedekind, 1927, p. 44, pl. iv. fig. 15.

*Diagnosis.*—Phaceloid to sub-cerioid diphymorphic *Acervularia* with septa, most of which terminate at the aulos, although some of the major septa, in a much attenuated with complete and incomplete axial tabulæ, the former usually deeply concave, and transverse outer tabulæ often inclined and sometimes curved. Dissepiments are absent. Gemmation is marginal.

*Description and Remarks.*—The corallites, which are long and slender, are closely packed and partially contiguous. Most of them are cylindrical, but some are prismatic or subprismatic through mutual pressure. They average 7·5 mm. in diameter, and have about fifty septa. The septa dilate at the aulos, and much stereome is present. The axial tabulæ in *A. conglomerata*, although simpler, differ less from those of the more typical forms of *Acervularia* than those of the other two diphymorphic forms of the genus here described.

*Horizon and Locality.*—Lower Salopian, Högklint Limestone, Högklint ("Riffkalk, Hor. III., Hedströms," Wedekind), Slite Group of Limestones, Hallshuk, N. Gotland.

*Acervularia breviseptata*, Weissermel. (Pl. II. figs. 15–17; Pl. III. fig. 4.)

*Acervularia luxurians*, var. *breviseptata*, Weissermel, 1894[1], p. 41; 1894[2], p. 608, pl. xlix. figs. 4, 5.

*Diagnosis.*—Cerioid *Acervularia* with short septa, which all dilate and terminate at the aulos; with inner tabulæ, which are complete, and mostly horizontal and flat; with flat outer tabulæ; and no dissepiments. Gemmation is almost entirely marginal and non-parricidal, although some parricidal budding of the type of *A. ananas* occurs.

*Description and Remarks.*—The characters of *Acervularia breviseptata* are well summarized in the diagnosis, and it only remains to add that the prismatic corallites are seldom more than 4 mm. in diameter and have twenty to twenty-six septa. Whilst typically the major and minor septa end at the aulos, and the tabulæ are remarkably flat and regularly spaced, yet in some specimens the major septa, in much attenuated form, extend inwards beyond the aulos, and the axial tabulæ are concave. These intermediate varieties unite the typical *A. breviseptata* with *A. ananas*, var. *singularis*.

*Horizon and Locality.*—Lower Salopian, Högklint Limestone, many localities along the north shores of Gotland.

*Acervularia cæspitosa*, Hall. (Pl. II. figs. 6–10.)

*Diplophyllum cæspitosum*, Hall, 1851, p. 399; 1852, p. 116, pl. xxxiii. figs. 1 *a–r*.

*Diagnosis.*—Dendroid diphymorphic *Acervularia* with short septa, which dilate strongly, and end axially at the aulos; flat or flexed, distant, axial tabulæ, and no dissepiments.

*Description and Remarks.*—The corallites are slender, elongated, and widely separated, and build up, according to Hall, large colonies. In the small specimen (a piece of one of Hall's types), kindly sent us by Dr. R. S. Bassler, the largest corallites are 8 mm. in diameter, and have about forty septa, all of which end with strongly dilated axial edges at the aulos, or extend just beyond it. Hall states that there are fifty "lamellæ," and his figures show that in some instances the septa continue inwards well beyond the aulos, but in a much reduced condition. This inward prolongation of the septa, it will be remembered, also occurs in the other diphymorphs of *Acervularia*. The axial tabulæ, which are indifferently flat or sagging, may be as much as 5 mm. apart, but the outer tabulæ, although often still widely spaced, are more numerous and more closely packed.

The form resembles *A. conglomerata* in many respects, but the corallites are much more widely separated, the septa more strongly dilated, and the tabulæ are much more distant.

*Horizon and Localities.*—Lower part of the Niagaran Limestone Group. North-east New York, "quite abundant at Lockport, but rare in other places."

Nicholson (1875, p. 59) states that the species occurs in large masses in the Niagaran Limestone of Thorald, Ontario, Canada; and Lambe (1901, p. 158) identifies Billing's *Cyathophyllum pelagicum* from the Silurian (Division II.) of Boscie Bay River, Anticosti. Whilst we cannot express an opinion upon the correctness of Nicholson's determination, we are able to correct Lambe's identification, and to state that *Cyathophyllum pelagicum*, Billings, a small piece of which has been sent to us by Dr. E. M. Kindle, is not *Diplophyllum cæspitosum*, Hall, but belongs to a species probably allied to *Stauria favosa* (Linnæus).

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## EXPLANATION OF THE PLATES* †.

### PLATE II.

*Figs.* 1-5. *Xiphelasma tubulatum* (Schlotheim). Holotype of *Tubiporites tubulatus*, Schlotheim. Silurian, Gotland. Geol. Palæont. Inst. und Mus. der Universitat, Berlin (Naturkunde Museum).

Fig. 1. Transverse section. × 1·5.
Fig. 2. Transverse section. × 4 (drawing).
Fig. 3. Longitudinal section. × 1·5.
Figs. 4, 5. Longitudinal section. × 3 (drawing).

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* The magnifications may be a shade above or below the round numbers given, especially in the case of the drawings.

† (R. 28883) etc. indicate a British Museum specimen. The sections

*Figs.* 6–10. *Acervularia cæspitosa* (Hall). Syntype of *Diplophyllum cæspitosum*, Hall, Niagaran, Lockport, State of New York, U.S.A.
Figs. 6, 7. Longitudinal section. × 1·5. (R. 28883-4.)
Figs. 8, 9. Transverse section. × 1·5. (R. 28885.)
Fig. 10. Transverse section (same as figure 8). × 2·5. (R. 28885.) Drawing.

*Figs.* 11–13. *Acervularia conglomerata* (Wedekind). Salopian, Slite Group, Hallshuk, N. Gotland. Sections cut from British Museum specimen R. 24349, F. A. Bather Coll.
Fig. 11. Longitudinal section. × 2. (R. 28886.) Drawing.
Fig. 12. Transverse section. Nat. size. (R. 28887.)
Fig. 13. Transverse section. × 2·5. (R. 28887.) Drawing.

*Fig.* 14. Generalized drawing based on R. 28888 to illustrate the longitudinal section (× 1·75 approx.) of *Acervularia ananas* (Linnæus), varietates *ananas* (Linnæus), et *truncata* (Wahlenberg).

*Figs.* 15–17. *Acervularia breviseptata*, Weissermel. Salopian, Hogklint Limestone (?), Kappelshamn, Gotland. Naturhistoriska Riksmuseet, Stockholm. Hisinger Coll.
Fig. 15. Transverse section of specimen 227. Nat. size.
Fig. 16. The same. × 3.
Fig. 17. Longitudinal section of specimen 225. × 2.

## PLATE III.

*Fig.* 1. *Acervularia ananas* (Linnæus), var. *truncata* (Wahlenberg). Wenlock Limestone, Wenlock. Transverse section. × 3. (R. 28889.)

*Fig.* 2. *Acervularia ananas* (Linnæus), var. *singularis*, Lang & Smith. Salopian, Island of Lilla Karlsö, Gotland. Transverse section. × 3. (R. 28890.)

*Fig.* 3. *Acervularia* near *A. ananas*, var. *singularis*, but approaching *A. breviseptata*. Salopian, Högklint Limestone (?), Vestoös, Parish of Hall, Gotland. Transverse section. × 3. (R. 28891.)

*Fig.* 4. *Acervularia breviseptata*, Weissermel. Salopian, Högklint Limestone (?), Kappelshamn, Naturhistoriska Riksmuseet, Stockholm. Hisinger Coll. no. 225. Transverse section. × 3.
(Figures 1–4 illustrate the graduation of the typical *A. ananas* (var. *truncata* only differs in being phaceloid instead of cerioid) into the diphymorphic *A. breviseptata*.)

*Fig.* 5. *Acervularia densa*, sp. n. Salopian, Upper Visby Marl or Högklint Limestone, Hallshuk, Parish of Hall, N. Gotland. F. A. Bather Coll. Transverse section (R. 28892) cut from holotype (R. 24353). × 3 (drawing).

*Figs.* 6–8. *Acervularia exigua*, sp. n. Holotype. Salopian, Island of Lilla Karlsö, Gotland. Naturhistoriska Riksmuseet, Stockholm. Hisinger Coll. no. 182.
Fig. 6. Transverse section of cylindrical corallite. × 3.
Fig. 7. Transverse sections of four prismatic corallites of the same specimen. × 2.
Fig. 8. Longitudinal section. × 2.
(The "tertiary" septa are particularly seen in fig. 6.)

## IX.—*Some* Ascaridæ *from Queensland.*

By H. A. Baylis, M.A., D.Sc.

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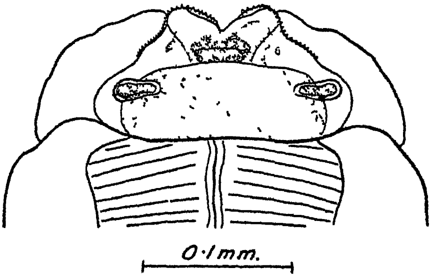
The following is a further contribution to the series of papers dealing with material in the helminthological collection of the School of Public Health and Tropical Medicine, Sydney, N.S.W., several of which have already appeared in this journal. Co-types of the new species will be deposited in the British Museum (Natural History) and in the collection at Sydney.

The three species described in the present note all belong to the subfamily Anisakinæ of the family Ascaridæ.

### 1. *Porrocæcum scoliodontis*, sp. n. (Figs. 1–3.)

This species occurred in the stomach and intestine of a dog-shark (*Scoliodon* sp.). The locality is not mentioned, but was probably Cleveland Bay, Townsville. Males measure up to 67 mm., females up to 85 mm. in length. The maximum thickness is about 1·5–1·9 mm. The measurements in the following description refer to the largest male and female present in the material, which, besides adults, includes a number of immature forms.

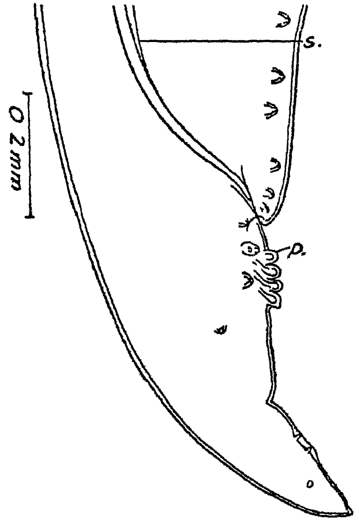
Fig. 1.



*Porrocæcum scoliodontis*, sp. n. Head of female; dorsal view.

The cuticular striations are conspicuous and the intervals between them measure up to 15 $\mu$. There are no lateral alæ. The diameter of the head is about 0·27 mm. The lips are short and wide and are separated from the neck by a distinct groove. The length of the lips is about 0·08 mm. in the male and 0·12 mm. in the female. There are no interlabia. The dorsal lip (fig. 1) has paired anterior processes, bordered by the dentigerous ridge and containing pulp-lobes with a posteriorly directed process. The pulp of the lip also forms a median internal lobe of pentagonal shape. The œsophagus, measured from the extremity of the head and including the posterior ventriculus, is 7·3 mm. long in the male, 6·8 mm. in the female. The ventriculus, which is straight and narrow, measures 2 56 mm. in length in the male and 1·75 mm. in the female. The intestinal cæcum extends forward to between 3 5 and 4 mm. from the anterior extremity. The nerve-ring is situated at about 1 mm. from the anterior end, and there is a pair of cervical papillæ a short distance behind it.

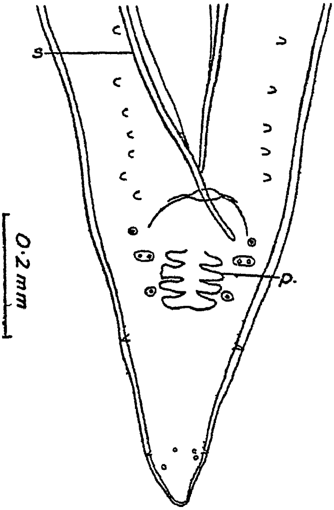
Fig. 2.



*Porrocæcum scoliodontis*, sp. n. Posterior end of male; lateral view. *p.*, postcloacal structure; *s.*, right spicule.

The tail of the male is about 0·6 mm. long and bluntly conical. At a short distance behind the cloacal aperture there is a remarkable structure consisting of four transversely elongated processes, each attached in the mid-ventral line by a median stem. The whole structure is covered with thick and highly refringent cuticle, and each of its four portions appears to have a "pulp" like the typical caudal papillæ. There are seven pairs of postanal papillæ, arranged as indicated in figs. 2 & 3. The most anterior of these is situated at the corners of the cloacal opening. The next pair, situated at the level of the first of the four median processes, consists of double papillæ. Of the other pairs two are lateral and the rest subventral. The preanal papillæ consist of a row of about thirty on each side. The spicules are about 3·4 mm. long and are tubular and alate for the greater part of their length. The alæ, however, disappear a little before the tips of the spicules.

Fig. 3.



*Porrocæcum scoliodontis*, sp. n. Posterior end of male; ventral view. *p.*, postcloacal structure; *s.*, right spicule.

The tail of the female is conical and tapering, and measures up to 0·9 mm. in length. The vulva in the largest specimen is situated at about 35 mm. from the anterior extremity (a little behind the anterior third of the body). The vagina runs posteriorly from it. The eggs are spherical and very small, measuring only about 0·05 mm. in diameter.

Linton (1901) described an Ascarid from the tiger-shark (*Galeocerdo tigrinus* [=*arcticus*]) from Woods Hole, Massachusetts, under the name of *Ascaris brevicapitata.* This form appears to be very similar to the species here described. In a later paper Linton (1906) attributed some immature specimens from the dusky shark (*Carcharinus obscurus*) to

*A. brevicapitata*, and mentioned that "one of the smaller forms was transparent enough to allow it to be demonstrated that it belonged to the type which has a diverticulum of the intestine and an elongated basal enlargement of the œsophagus." *A. brevicapitata* is therefore evidently a member of the modern genus *Porrocæcum*, and should be designated *Porrocæcum brevicapitatum* (Linton). Most of the measurements given by Linton (1901) are very close to those of *P. scoliodontis*, though the female reached a larger size (102 mm.). It may even be the case that the species are identical. Linton gives a figure of a lateral view of the tail of the male (1901, pl. iii. fig. 21) in which five very prominent papillæ are shown a little behind the cloaca. Fig. 22 of the same plate is a "diagram showing arrangement of anal papillæ so far as could be made out." This does not show any structures, apart from the ordinary papillæ, comparable with the peculiar postcloacal structures of *P. scoliodontis*. It is not clear, however, whether the diagram represents an actual ventral view or a reconstruction of the arrangement of the papillæ as observed in lateral views. If the latter were the case it seems possible that the prominent papilla-like structures shown in the lateral view, though interpreted as simple papillæ, may have been actually specialized structures like those of *P. scoliodontis*.

Another species to which reference should be made is *Porrocæcum galeocerdonis*, Thwaite, 1927. This form, recorded from *Galeocerdo tigrinus* from Ceylon, is in many respects very similar to *P. scoliodontis*, but appears to be considerably smaller. The number of preanal papillæ in the male is between 47 and 70 on each side, and there are many differences in the measurements. The most interesting point, however, is that "immediately behind the anus [in the male] several small spinous processes are to be seen projecting outwards from the cuticle, giving to that portion of it a serrated appearance" (Thwaite, 1927). In the accompanying figure about seven pairs of such spinous processes are shown. It is evident that Elasmobranch fishes harbour a group of extremely closely related forms of *Porrocæcum*. *P. pristis*, Baylis & Daubney, 1922, from *Pristis perotteti*, though without special caudal structures in the male, is very similar to the other forms referred to. The male of *P. antarcticum* (Leiper & Atkinson, 1914), from *Mustelus antarcticus*, is unknown. The status of *Ascaris circularis*, v. Linstow, 1907, from *Pristis antiquorum*, is uncertain, but it is possibly a *Porrocæcum*.

### 2. *Porrocæcum crocodili*, Taylor, 1924.

What appears to be this species occurs in the collection from the following hosts:—

*Crocodilus johnstoni* (stomach), Armidale, 26th May, 1914; collected by Dr. W. Nicoll.

*C. johnstoni* (stomach), locality not given, 6th Sept. 1917; collected by Mr. J. W. Fielding (a few immature specimens).

*Varanus gouldii* ("body-cavity"), Townsville, 22nd April, 1914.

*P. crocodili* was originally recorded (Taylor, 1924) from a West African crocodile. The present specimens, although occurring in Australia, appear to be morphologically identical with the co-types of the species. A pair of these were presented to the British Museum (Natural History) by Professor Warrington Yorke, and further examples for comparison have been kindly lent to the writer by Professor B. Blacklock, of the Liverpool School of Tropical Medicine.

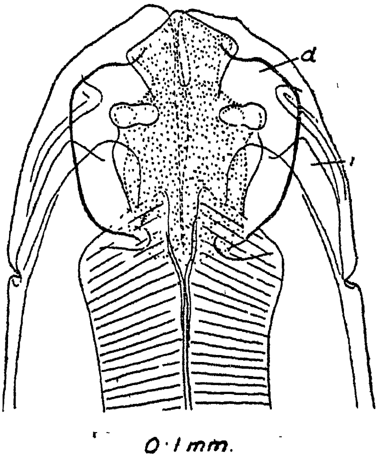
In one respect there appears to be a discrepancy from the original description. Taylor describes and figures a pair of double papillæ at the sides of the cloaca or a little behind it in the male, while the present writer has been able to detect only a pair of simple papillæ in this position. This applies, however, not only to the Australian specimens but also to the co-types from the original West African source. Taylor's specimens seem to have been not quite fully grown, and the females were not gravid. The Australian specimens attain a somewhat greater size, the males from *Crocodilus johnstoni* measuring up to 37 mm. in length and 1 mm. in thickness, the females up to 55 mm. and 1·35 mm. respectively.

The examples from *Varanus gouldii* are not quite so large. The spicules of the male measure 0·81–1 mm. in length. The eggs present in the uterus of a gravid female are subglobular and relatively very small, having an average diameter of about 0·04 mm.

### 3. *Dujardinia australiensis*, sp. n. (Figs. 4 & 5.)

This species was collected by Mr. J. W. Fielding in September 1917 from the stomach of *Crocodilus johnstoni*. Most of the specimens are coiled in watch-spring fashion. Mature males measure 14–23 mm. in length, females 18·5–24·8 mm. The maximum thickness is 0·28–0 6 mm. in the male and 0·55–0·75 mm. in the female. The transverse striations of the cuticle are fine and indistinct. The dorsal lip (fig. 4) has a pentagonal median lobe into which project two pulp-processes with broadened ends. The width of the lip is about equal to its length. Each ventro-lateral lip is asymmetrical, having its ventral angle somewhat elongated. The interlabia are not very large and are not conspicuously striated. The distance from the anterior extremity to the posterior end of the œsophagus (including the small posterior bulb) is 3·1–4·1 mm. The maximum width of the œsophagus is 0·09–0·13 mm., and the diameter of the bulb 0·11–0·16 mm. The intestinal cæcum extends forward to a point 1·12–1·34 mm. from the anterior extremity. The nerve-ring is situated at 0·46–0·6 mm., and the excretory pore at 0·42–0·5 mm. from the anterior end. There is a pair of very small cervical papillæ situated somewhat behind the nerve-ring (at 0·83 mm. from the anterior end in a large female).

Fig. 4.

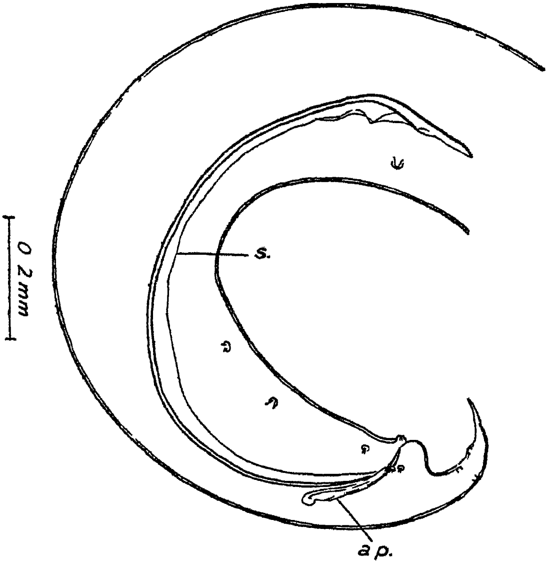


*Dujardinia australiensis*, sp. n. Head of female; dorsal view. *d.*, dorsal lip; *i.*, interlabium.

The tail is rapidly tapering and sharply pointed in both sexes. In the male it is 0·26–0·27 mm. long. The spicules measure 1·5–1·55 mm. in length and are very similar to those of *D. vandenbrandeni*, Baylis (1929), except that they appear to be alate throughout their length. The accessory piece again has a simple point and is very like that of *D. vandenbrandeni*. It is 0·16–0·2 mm. long. There are nine pairs of papillæ and apparently a median ventral precloacal papilla. The arrangement of these (fig. 5) is the same as in *D. vandenbrandeni.*

The tail of the female is 0·3–0·35 mm. long. The vulva is situated at 8·7–10·7 mm. from the anterior end. The vagina runs posteriorly and enlarges gradually to form a wide egg-chamber, which gives off the two parallel uterine branches. The eggs are oval and measure 0·08–0·083 mm. × 0·055–0·058 mm.

Fig. 5.



*Dujardinia australiensis*, sp. n. Posterior end of male; lateral view. *a.p.*, accessory piece; *s.*, right spicule.

This species is evidently very closely related to *D. vandenbrandeni*, a form found in crocodiles in the Belgian Congo. The two species differ, however, in several minor characters. The most readily observed of these is the shape of the lips and interlabia. In *D. vandenbrandeni* the lips are much longer and narrower, and the interlabia are large, swollen, and marked with very conspicuous transverse striations. From the other described species of *Dujardinia* the present form differs more conspicuously. The characters of these have been summarized elsewhere (Baylis, 1923), and need not be repeated here.

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## X.—*Two new Parasites from the King Cobra* (Naja hannah).

By G. D. BHALERAO, M.Sc., Helminthologist, Imperial Institute of Veterinary Research, Muktesar-Kumaun, U.P., India.

THE material described in this paper was obtained from three King Cobras, two of which were shot at Muktesar and the third about two miles away from it. I wish here to express my indebtedness to Messrs. H. Cooper and D. Keiller for placing the reptiles at my disposal.

### NEMATODA.

### *Kalicephalus radicus*, sp. n.

In each case about two dozen specimens were recovered from the intestine and rectum. The worms are small and slender. The males measure 6·67–7·32 * in length and 0·27–0·285 in thickness, the maximum being attained slightly posterior to the œsophagus, behind which the thickness remains uniform as far as the commencement of the bursa. The females measure 8·5–9·2 in length and 0·37–0·42 in thickness. In the females the thickness attains its maximum at some distance both anterior and posterior to the vulva, whence it diminishes both anteriorly and posteriorly. The head (fig. 1) is compressed laterally and is distinctly set off from the rest of the body. It measures 0·15–0·19×0·1–0·17. The mouth is directed anteriorly and its margin is smooth ; it possesses the structure typical of the genus. The valves are 0·83 in height and are

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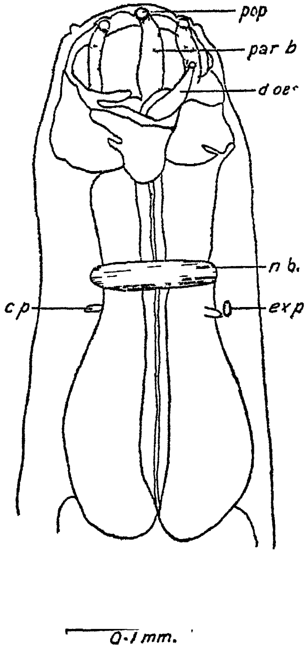
* All measurements in millimetres.

Fig. 1.



*Kalicephalus radicus.* Anterior end.

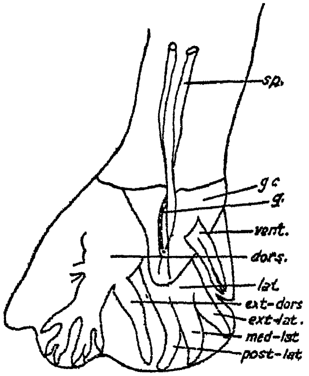
*Explanation of Lettering of all figures.*

| | |
|---|---|
| *b.* | Bursa. |
| *bl.* | Bell. |
| *c.p.* | Cervical papilla. |
| *d.œs.gl.* | Duct of œsophageal gland. |
| *dors.* | Dorsal ray. |
| *e.x.p.* | Excretory pore. |
| *ext.-dors.* | Externo-dorsal ray. |
| *ext.-lat.* | Externo-lateral ray. |
| *g.* | Gubernaculum. |
| *g.c.* | Genital cone. |
| *lat.* | Lateral ray. |
| *med.-lat.* | Medio-lateral ray. |
| *n.* | Neck. |
| *n.b.* | Nerve-band. |
| *n.g.* | Nerve-ganglion. |
| *o.* | Ovarian cell. |
| *o.j.* | Ovijector. |
| *p.* | Proboscis. |
| *p.gl.* | Prostate gland. |
| *p.sh.* | Proboscis sheath. |
| *pap.* | Papilla. |
| *par.b.* | Parenchymatous band. |
| *post.-lat.* | Postero-lateral ray. |
| *sp.* | Spicule. |
| *t.* | Testis. |
| *u.* | Uterus. |
| *v.* | Vulva. |
| *vag.* | Vagina. |
| *vent.* | Ventral ray. |

thickened at the base. From each valve three parenchymatous bands pass anteriorly and terminate in papillæ surrounding the mouth. The duct of the œsophageal gland extends more than half the length of the buccal capsule, and is about 0·15 in length. The buccal capsule is oval and measures 0·11–0·13 × 0·13–0·15. The œsophagus is 0·313–0·392 in length and 0·161–0·225 thick. The nerve-ring is situated 0·111–0·117 from the anterior end of the œsophagus. The cervical papillæ are situated slightly posterior to the nerve-ring, anterior to the middle of the œsophageal bulb. The excretory pore is situated at the level of the cervical papillæ and is very faintly indicated.

*Male.*—The genital bursa is trilobed and is somewhat truncated obliquely in lateral view (fig. 2). The dorsal ray is comparatively short, and gives rise to externo-dorsals near its origin. It divides into two branches, each of which immediately divides, and the inner branches of these last are again divided for about half their length. The externo-dorsal is slightly curved, and terminates at a small distance from the bursa. All the lateral rays originate from the common trunk, the medio-lateral being the stoutest and the externo-lateral the shortest of the three. All the three laterals are distinct for more than half their lengths, and the postero- and medio-laterals are slightly bent dorsally. The ventral rays are long and slender and are closely applied to each other.

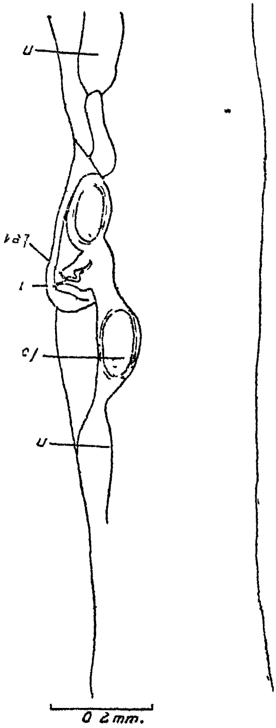
Fig. 2.



*Kalicephalus radicus.* Posterior end of male.

The testis commences about 1·8 from the anterior end and then passes anteriorly as far as the posterior end of the œsophageal bulb. It then loops posteriorly and enlarges insensibly into a vas deferens which opens into the vesicula seminalis, extending posteriorly for about 1·9. The spicules are slender and taper to fine points. They are alate, and measure 0·282–0·295 in length and 0·015 at the base. The gubernaculum is a slender rod, slightly swollen in the centre, and measuring 0·111–0·125 in length. The genital cone is well developed and measures 0·117 in length.

Fig. 3.



*Kalicephalus radicus.* End portion of female genitalia.

*Female.*— The tail is 0·36–0·44 long and tapers gradually, in a somewhat wavy manner, to a rounded point. The vulva (fig. 3) is only slightly raised, and is situated 3–3·2 from the posterior end, thus dividing the body in the ratio of 2 : 1. The vagina is very short, and bifurcates into two ovijectors leading to two divergent uteri. The eggs are thin-shelled and measure 0·044–0·08 × 0·034–0·053.

The genus *Kalicephalus* was created by Molin (1861) to include in it his seven new species. Ortlepp (1923) remarks that, "according to present-day standards his descriptions are quite inadequate for specific determination"; he himself divides the genus into two groups, one in which the uteri are opposed and the other in which they are convergent. The present specimen with the divergent uteri belongs to the first group. Among the species which can be included in this group it comes nearest to *K. colubri*, Ortlepp, 1923, especially when the arrangement of the bursal rays is taken into account, a character so much emphasized from the systematic standpoint; but it can be separated from it by the following characters:—

(1) The externo-dorsal ray extends much closer to the bursal margin; (2) the postero- and medio-lateral rays are not so closely disposed—moreover, the medio-lateral ray is the stoutest of all the three lateral rays; (3) the genital cone is well developed; (4) the head is distinctly set off from the body; (5) the gubernaculum is not quite insignificant; and (6) the nerve-ring, the excretory pore, and the cervical papillæ are more anteriorly situated.

These points being of sufficient importance to justify the creation of a new species, I propose the name *Kalicephalus radicus* for it.

Host.—*Naja hannah.*

*Location.*—Intestine, rectum.

*Locality.*—Muktesar.

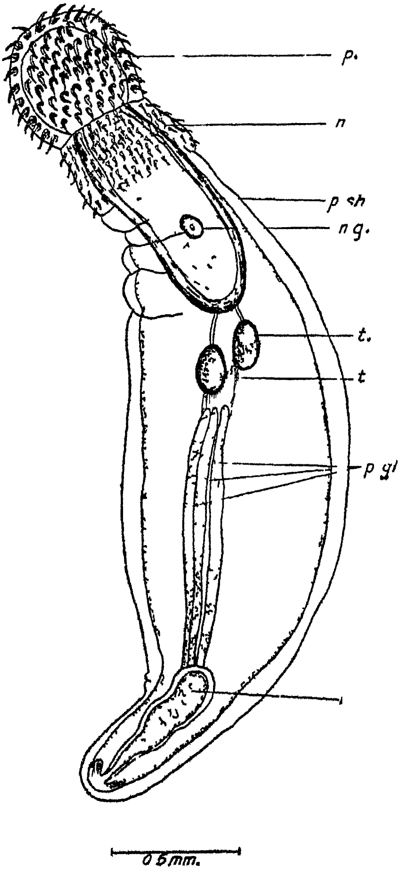
## ACANTHOCEPHALA.

### *Centrorhynchus reptans*, sp. n.

Of the three King Cobras that were dissected, two harboured these Acanthocephala in the intestine and rectum.

The worms of both sexes are small and spindle-shaped, the posterior end being narrower than the anterior. The male specimens (fig. 4) measure 3·14–3·3 in length and 0·71–0·925 in thickness. The body is covered with a thick cuticle which is devoid of spines. The proboscis, when fully everted, measures 0·77 in length, and appears to be divided into two portions—a globular anterior portion measuring 0·43–0·49 and a somewhat cylindrical posterior portion, the neck. Both the anterior and posterior portions are armed with numerous hooks arranged radially in twenty-four alternating horizontal rows. The hooks on the anterior portion of the proboscis are much larger and have recurved roots; they measure 0·057 in length. The hooks on the neck portion are much smaller, and measure 0·029–0·039 in length. The proboscis sheath is 0·87–0·96 long and is inserted at about the middle of the proboscis, at the posterior end of its globular anterior portion. The central nervous ganglion is situated slightly posterior to the middle of the proboscis sheath. The lemnisci arise from the base of the proboscis and extend, if they are not coiled, a little posterior to the proboscis sheath.

Fig. 4.

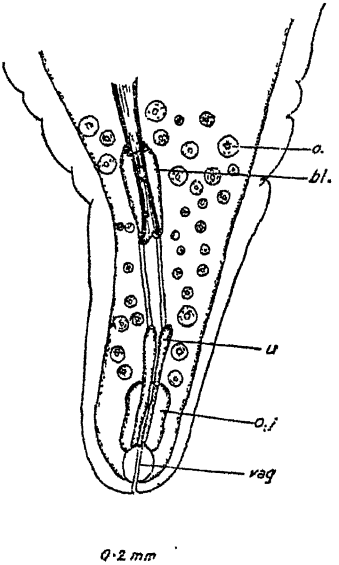


*Centrorhynchus reptans.* Entire male.

*Male.*—The testes are two ovoid bodies situated obliquely one behind the other, slightly behind the proboscis sheath; they measure 0·168 × 1·112–0·13. The prostate glands are three long tubular bodies commencing immediately posterior to the testes and opening into the bursa at about 0·6 from the posterior end.

*Female.*—The ovarian cells are found floating in the cœlomic cavity at various stages of development. No fertilized eggs were seen. The uterine bell (fig. 5) is 0·2 long and 0·065 wide. From its posterior end two thin ducts, 0·17 long, lead to the two uteri. These latter, after a distance of 0·11, are surrounded by a dumbbell-shaped musculature which acts as an ovijector. The uteri open posteriorly by wide orifices into a small receptacle; this communicates with the exterior by the vagina, which opens at the posterior extremity of the body.

Fig. 5.



*Centrorhynchus reptans.* Posterior end of female.

Adult forms of the known species of *Centrorhynchus* have been recorded from avian hosts only. Chandler (1925) described *C. erraticus* from a cat in Calcutta, but these specimens were immature, and the author himself is of the opinion that "these must have been liberated from the intestine of a bird eaten by the cat, which temporarily established themselves in the mammalian host." The fact that they were immature corroborates the hypothesis of Chandler. The interest of the species described above lies in the fact that it is the first adult species of the genus recorded from a reptilian host. Since it differs from all the known species of *Centrorhynchus*, the name *C. reptans* is suggested for it.

Host.—*Naja hannah.*

*Location.*—Intestine, rectum.

*Locality.*—Muktesar.

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## XI.—*On the Blood System of* Parabathynella malaya, *G. O. Sars*. By H. GRAHAM CANNON, Sc.D., Professor of Zoology in the University of Sheffield.

THE blood system of *Bathynella natans* was described by Chappuis in 1915 (p. 168). His account has been summarized by Calman (1917, p. 501), who states :—" The short heart lies in the fourth thoracic somite, and does not exceed in diameter the vessels that come off from it in the middle line in front and behind. No ostia have been seen. While the anterior vessel is no doubt an aorta (arteria dorsalis, Chappuis), the posterior vessel is described as a 'vena dorsalis' collecting the blood from the sixth abdominal somite and returning it to the heart."

In 1930, Dr. Calman very kindly handed me a specimen of the recently-described *Parabathynella malaya*, G. O. Sars (1929), which I sectioned with a view to studying its internal anatomy. I found that, while its fixation was not good enough for a detailed study of other organs, the blood system was comparatively well preserved.

The heart consists of a short barrel-shaped muscular tube lying dorsally in fourth thoracic segment (see fig., A, p. 111).

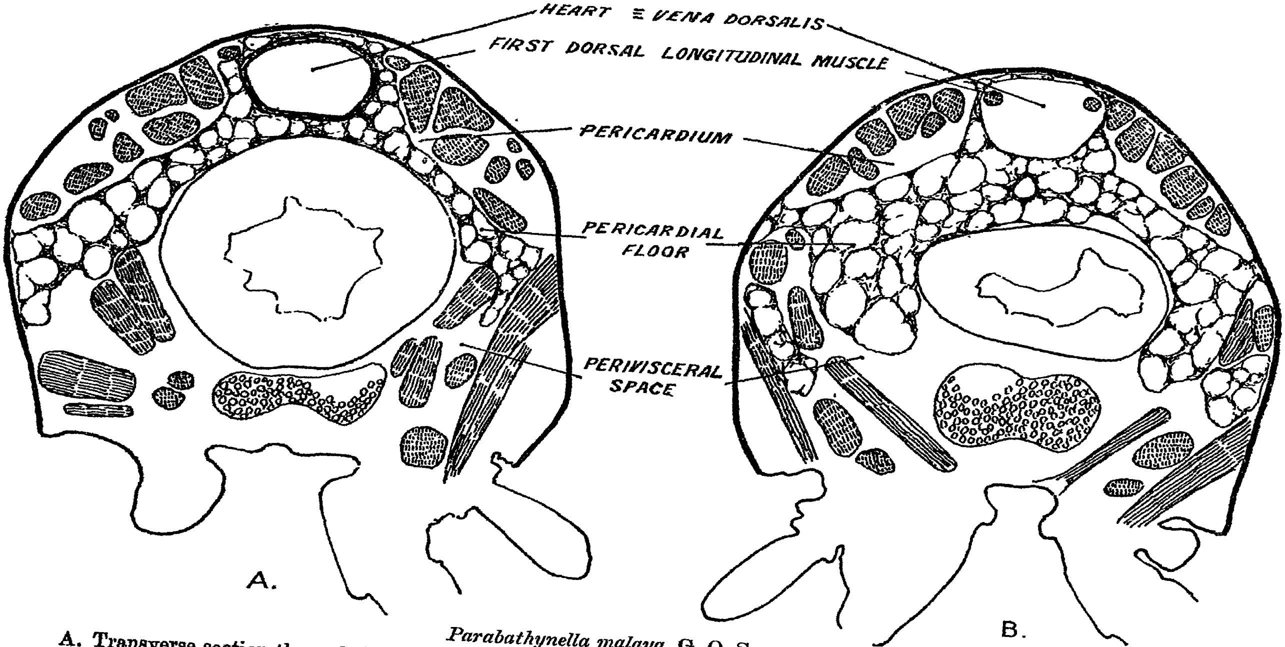
A well-defined pericardial floor, in the typical position in relation to the heart and gut, extends backwards from this segment to the hinder part of the abdomen. In the abdominal segments, with the exception of the first, it consists of the usual thin membrane lying above and close against the dorsal surface of the gut and extending down laterally to be attached to the ventro-lateral angles of the segments. In the first abdominal segment, and in the thoracic segments as far forwards as the heart, it is attached to the body-wall more dorsally, and this attachment is incomplete in places to accommodate the dorso-ventral limb musculature. Throughout this region, however, it is not a single membrane, but a parenchymatous mass (see figure, A).

The pericardial floor in all Arthropoda is really a double membrane formed by the collapsed walls of the cœlomic sacs. In *Parabathynella* it appears that, while the upper surface of the pericardial floor has remained in its typical position, its cells have swollen to such an extent that in each segment a parenchymatous mass hangs down on either side of the gut (see figure). These masses fuse together fore and aft, and lie close against the gut-wall. The parenchyma extends over the gut so that the latter is saddled by a blanket of this type of tissue.

In front of the heart the pericardial parenchyma extends forwards dorsally as a tongue to the brain, and ventro-laterally as two prolongations in which are embedded the segmental excretory organs (maxillary glands).

In the heart segment the parenchyma extends upwards and invests the heart-tube. This again supports the view that the parenchyma is formed from the collapsed cœlomic sacs, since, in the Crustacea, the heart is formed by the development of muscles on the inner faces of the cœlomic sacs. In my paper on the development of *Estheria* (1924, figs. 14–17) I figured sections of the heart showing the developing cardiac muscles invested on the outer side by the collapsed outer and inner walls of the cœlomic sacs. In *Parabathynella* these collapsed walls are represented by the layer of parenchmya extending up the sides and over the top of the heart.

The condition behind the fourth thoracic segment can best be described by saying that in each segment the arrangement is the same as in the heart segment, but the muscular heart-wall is absent. That is, a parenchymatous tongue projects upwards to the dorsal body-wall on either side of the middle line, thus separating the mid-dorsal space—



*Parabathynella malaya*, G. O. Sars.
A. Transverse section through fourth thoracic segment. B. Transverse section through sixth thoracic segment.

Chappuis's vena dorsalis—from the lateral pericardium (see figure, B). These tongues are segmental. Intersegmentally there are gaps which are homologous with the ostia of those Crustacea with long tubular hearts. As the muscular heart of *Parabathynella* extends through only one segment, it naturally does not possess ostia.

In *Estheria* (Cannon, 1924), *Chirocephalus* (Cannon, 1926), and *Hemimysis* (Manton, 1928), and probably in Crustacea generally, the dorsal longitudinal muscles of the body are formed on the outer faces of the outer wall of the cœlomic sacs, as the walls shrink inwards away from the adjacent ectoderm to form the pericardial space. The muscles thus come to lie in the pericardial cavity.

In the heart segment of *Parabathynella* the dorsal longitudinal muscles occupy this typical position. On either side the muscles consist of a series of separate muscle-bands, of which that nearest the middle line—which I call the first dorsal longitudinal muscle—is a narrow strand, while those more lateral are comparatively massive (see figure, A). These muscles are attached anteriorly to the front edge of the tergum of the segment to which they belong, and posteriorly to a corresponding point on the tergum behind.

In all segments behind the heart, as far back, certainly, as the third abdominal segment, and probably to the hind end of the abdomen, the first dorsal longitudinal muscles do not run in the pericardial space, but in the median blood-space (see figure, B). They enter the space through an ostium and make their exit through the next succeeding ostium. Embryologically this must mean that the ability to form longitudinal muscle-strands has extended from the outer face of the cœlomic sac over its upper angle to the dorsal part of its inner face.

Anteriorly the heart passes into a lacunar channel in the parenchymatous tissue which can be traced as far as the brain. I think that this vessel gives off branches to the maxillary glands and a median branch to the anterior part of the gut, but the vessels are irregular, and the fixation is not good enough to be certain on this point.

Immediately over the gut, and under the vena dorsalis, a well-marked lacunar blood-space (the intestinal duct) runs forward to open into the vena dorsalis where this passes into the heart—that is, at the hinder margin of the fourth thoracic segment. Irregular channels appear to pass up the side of the gut, between this and the parenchyma at its sides, and join the median duct.

Chappuis (1915, p. 168), from observations on living specimens of *Bathynella natans*, describes the blood as passing forwards along the vena dorsalis from the sixth abdominal segment to the heart. The heart then pumps the blood into the arteria dorsalis, from which it passes into lacunæ in the head. Calman (1917, p. 501) remarks that if the vena dorsalis is really a vein, collecting blood and returning it to the heart, it is "very unusual, if not unique among Crustacea." He suggests as possible that Chappuis made a mistake as to the direction of blood-flow in this region of the body.

I do not think that Chappuis made this mistake, for what he terms the vena dorsalis is really part of the heart. I believe that blood passes into this vessel from the pericardium through the ostia, in the same way as it would if the vena dorsalis were lined with muscles and so constituted a typical heart. It passes forwards into the lacunar system of the head and so into the perivisceral body-cavity. From here it passes up through the gaps in the lateral attachment of the pericardial floor and so again into the pericardium.

I cannot say in what direction the blood flows in the intestinal duct, but, since it opens immediately behind the heart, it may be that it is a venous duct collecting the blood from the parenchyma which envelops the gut.

The chief interest in the blood system lies in the occurrence of the first dorsal longitudinal muscles in the cavity of the vena dorsalis. Contraction of these muscles must serve to dilate the cavity of this vessel. A rhythmical contraction of the series passing forwards would thus produce, in effect, a peristaltic wave which would suck in blood through the ostia and pass it forwards to the heart. If this is so, then morphologically the heart occurs in the fourth thoracic segment, but physiologically it extends from this segment almost to the hinder limit of the body.

Calman has pointed out (1917, p. 508) that the apparent degeneracy of *Bathynella* may be largely ascribed to its diminutive size. In the arrangement of its dorsal longitudinal muscles it shows another character, not degenerate, but adaptive to its minute size. The muscles form an accessory circulatory mechanism. Chappuis states (1915, p. 168) that in the case of *Bathynella natans* the heart pulsates at the rate of 100 a minute. The heart of *Parabathynella* presumably beats with a similar frequency, and, since its diameter is about 50 $\mu$, it is not surprising that it has developed an accessory mechanism to overcome the viscous resistance of the blood in its capillary vessels.

While it is an accessory mechanism, it is independent of the heart itself, for the blood could be forced along the vena dorsalis without any contraction of the heart. This explains a statement of Chappuis (1915, p. 168): "Manchmal konnen die Pulsationen auch ausbleiben; die Circulation wird dann durch rhythmische Kontractionen des Darmes aufrecht erhalten." What he observed as rhythmical contractions of the gut were probably similar contractions of the overlying dorsal longitudinal muscles.

An interesting parallel to the blood system of *Parabathynella* is to be found in that of the small marine Ostracod *Cypridina* (*Doloria*) *levis*, which I have recently described (1931). In this form, also, there is a system of extremely narrow blood-vessels "provided with muscles running in their walls (not circular muscles) . . . by which they can be distended or collapsed. . . . It is suggested that this muscular system is an accessory circulatory mechanism," and that "circulation would still be possible in complete absence of the heart."

Another similarity between these two forms, for which I can give no explanation, is the conspicuous development of parenchymatous tissue throughout the body.

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## XII.—*New Helicoid Snails from the Mohave Desert.*—V. *The Genus* Oreohelix *in Southern California and Nevada.*

By S. Stillman Berry, Redlands, California.

Prof. Edmund C. Jaeger found opportunity on one of his latest outings to explore a portion of Clark Mountain, the culminating peak of a short range in the extreme north-eastern part of the Mohave Desert, which attains at the summit an altitude of just over 7900 feet. It therefore becomes in its higher portions very far from desert-like either in fauna or flora. In both of these features, as well, I am told, as in some geological aspects, considerable affinity is shown with the Charleston and Potosi Mountains to the northward in Nevada, and we find the presumption of such relationship well supported by the few land-snails taken. Hitherto no Mollusca whatever have been known from the range mentioned, and one species here described proves not only to be new, but to be the first member of the protean genus *Oreohelix* to be discovered within the boundaries of California, save only the mysterious *O.* (*Radiocentrum*) *avalonensis* (Hemphill)* from Santa Catalina Island, off the southern coast. The maritime and insular habitat of the latter is extremely singular, since the genus constitutes characteristically and *par excellence* the snail of snails for the Rocky Mountain region and the mountains of the Great Basin. The ensuing species becomes, therefore, Prof. Jaeger's most thrilling find to date. In connection with the description of this species opportunity is taken for a brief discussion of two related forms from Nevada, one of which likewise has not hitherto been described.

### *Oreohelix californica*, sp. n. (Figs. 1 & 2.)

*Description.*—Shell small, thin, low-conic; the whorls usually about 5, convex, simply carinate; body-whorl slightly to strongly descending back of the aperture, and with the carina generally almost obsolete before it reaches the lip. Aperture small, rounded or very weakly shouldered, its outline only slightly influenced by the carination, very oblique; margins converging. Peristome thin, not expanded, scarcely reflected at the umbilicus; umbilicus wide and funicular, at its best expansion contained 4 to 5 times in the diameter of the shell. Embryonic whorls 1½ measured medially, 2 measured suturally; planulate above, the first half-turn weakly concentrically wrinkled, the wrinkles thence becoming much stronger, especially on the last embryonic half-turn, and crossed by a very fine, rather irregular spiral striation; growth-lines on lower surface much finer and more even, being little, if any, stronger than the spirals; spiral sculpture on later whorls weakly developed (strongest on base of juvenile shells), often largely obscured by the numerous irregular growth-lines, which, however, are sufficiently delicate so that the surface is quite smooth and lustrous to the unaided eye.

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* Trans. San Diego Soc. Nat. Hist. vol. i. p. 104.

Fig. 1.

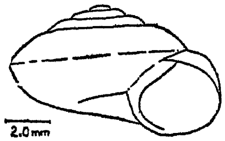
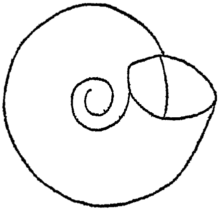


Fig. 2.



*Oreohelix californica*, sp. n., type-specimen.

Colour of upper surface Avellaneous to Buffy Brown with darker or lighter suffusions, the spire sometimes deepening to Hair-Brown; base lighter, Tilleul-Buff to Light Drab or Buffy Brown, varyingly rayed and clouded with Avellaneous to Wood-Brown; peripheral carina usually marked by a narrow buffy-white band, with a wider brown band (Wood-Brown to Buffy Brown) just below it and a smaller band above not quite halfway to the suture; 2 or 3 not very constant semitranslucent bands often visible on the base.

*Measurements.*—Caliper-measurements of ten mature shells are as follows:—

| | Maximum diameter. | Minimum diameter. | Altitude. | Diameter of umbilicus. | Number of whorls. |
|---|---|---|---|---|---|
| | mm. | mm. | mm. | mm. | |
| Paratype........ | 10·5 | 9·4 | 7·0 | 2·2 | $5\frac{1}{8}$ |
| Paratype........ | 10·4 | 9·4 | 6·7 | 2·1 | 5 |
| Paratype........ | 10·4 | 9·2 | 6·0 | 2·4 | 5 |
| Paratype........ | 10·4 | 9·0 | 6·1 | 2·3 | 5 |
| Type .......... | 10·0 | 8·7 | 5·6 | 2·3 | 5 |
| Paratype *, 7183 *a*. | 9·5 | 8·5 | 5·3 | 2·1 | $4\frac{2}{3}$ |
| Paratype * ...... | 9·5 | 8·4 | 5·2 | 2·2 | $4\frac{2}{3}$ |
| Paratype........ | 9·5 | 8·2 | 5·2 | 2·2 | $4\frac{2}{3}$ |
| Paratype *, 7183 *b*. | 9·2 | 7·8 | 5·1 | 2·2 | $4\frac{1}{2}$ |
| Paratype * ...... | 9·2 | 7·8 | 5·0 | 2·3 | $4\frac{1}{2}$ |

* Living specimens; shells apparently not quite mature, yet nos. 7183 *a* & *b* proved to contain 4 and 2 embryos respectively.

*Type.*—Cat. No. 7182 of the author's collection. Paratypes No. 7183 of the same collection; others to be deposited in the collections of the Academy of Natural Sciences of Philadelphia, the San Diego Museum, the British Museum (Natural History), and the private collection of Mr. Allyn G. Smith.

*Type-locality.*—Alt. ca. 7500 ft., at head of gulch on west slope of Clark Mountain, north-eastern San Bernardino County, California; 10 living and numerous empty shells taken among limestone fragments and fir-needles in rock-slides; Edmund C. Jaeger coll., 4 Oct., 1930.

*Remarks.*—This is a modest-appearing but very pretty little snail of the general type of *O. eurekensis*, Henderson & Daniels, *O. handi*, Pilsbry, and other species, but it most closely approximates to *handi*, with which, perhaps, some students would prefer to unite it as a subspecies. Nearly as small as this last, and admittedly not strongly differentiated, it nevertheless stands apart by reason of the more elevated and simply carinate (not pinched), less lenticular shell, rounded aperture, weak spiral sculpture regardless of age, relatively smooth and lustrous surface, and lack of periostracal fringings in the young. The species agrees with the typical section of the genus in being ovo-viviparous; for, as noted in the table of measurements, two of the living specimens, although thin-lipped and apparently a trifle short of full maturity, proved to contain embryos.

Fig. 3.

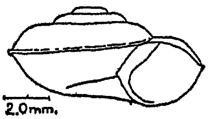


Fig. 4.

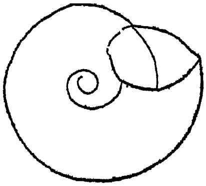
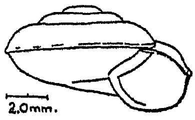


Fig. 5.



Figs. 3 & 4.—*Oreohelix handi*, Pilsbry, paratype.
Fig. 5.—*Oreohelix handi*, Pilsbry, Potosi Mountain, Nevada.

### *Oreohelix handi*, "Pilsbry & Ferriss," Pilsbry, 1917.
(Figs. 3–5.)

1917. *Oreohelix handi*, "Pilsbry & Ferriss," Pilsbry, Proc. Ac. Nat. Sci. Phila. 1917, p. 46, text-fig. 4 *b* (anatomy).
1918. *Oreohelix handi*, Pilsbry & Ferriss, Nautilus, vol. xxxi. p. 94.

*Type-locality.*—Alt. 9000–9500 ft., south of Griffith's Hotel, Charleston Mts., Nevada; J. H. Ferriss coll., 1916.

*Additional Localities.*—(1) Alt. 9200 ft., MacFarland's Spring, Charleston Mts., Nevada; 1 dead immature shell; Edmund C. Jaeger coll., 1928. (2) Alt. 7500 ft., among fir-needles and limestone fragments, north slope of Potosi Mt., 1 mile west of main peak, Clark County, Nevada; 8 mature, 12 immature, and 4 embryo shells, all dead; Edmund C. Jaeger coll., 25 June, 1930.

*Measurements.*—Caliper-measurements of eight mature shells are as follows:—

| | Maximum diameter. | Minimum diameter. | Altitude. | Diameter of umbilicus. | Number of whorls. |
|---|---|---|---|---|---|
| | mm. | mm. | mm. | mm. | |
| Type (*teste* P. & F.). | 10·2 | .. | 5·7 | .. | 4½ |
| Paratype, 4927 ... | 9·7 | 8·3 | 4·7 | 2·7 | 4¾ |
| Paratype, 4927 .. | 9·2 | 7·9 | 4·4 | 2·1 | 4½ |
| Paratype, 4927 .. | 9·0 | 7·7 | 4·4 | 2·2 | 4⅓ |
| Potosi Mt., 7172 | 8·6 | 7·6 | 4·6 | 2·2 | 4½ |
| Potosi Mt., 7172 | 8 3 | 7·3 | 4·3 | 2·0 | 4½ |
| Potosi Mt., 7172 | 8·2 | 7·1 | 4·4 | 1·8 | 4½ |
| Potosi Mt., 7172 | 8·0 | 6·9 | 4·4 | 2·1 | 4⅓ |

*Remarks.*—*Oreohelix handi*, s. s., as evidenced by paratypes in the author's collection received from Mr. Ferriss, is a very small species (adult diameter 8–10 mm.), the shell *strongly lenticular*, having the carina pinched into a distinct keel and the spire usually much flattened. The outer lip is strongly angled by the keel, the growth-lines are coarse, and the spiral sculpturing is *moderately* well developed, especially on the base of the shell, although projecting periostracal ornamentation in the young is weak.

The series from Potosi Mountain not only gives us an appreciable extension of the known range of *handi*, but brings it that much nearer to the haunt of *californica*. A certain approach to the latter species is also shown in some shell-characters, notably in a moderate weakening of the spiral sculpture. This series averages distinctly smaller in size than any of the lots.

### *Oreohelix handi jaegeri*, subsp. n. (Figs. 6 & 7.)

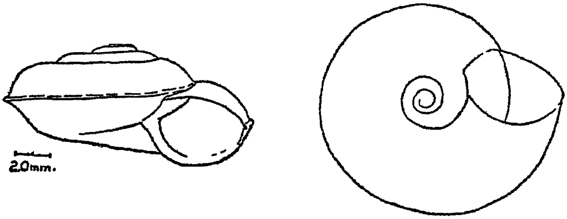
*Description.*—Shell similar to that of typical *handi*, but *much larger* (adult diameter ca. 14–16 mm.), strongly lenticular, the spire usually much flattened; carina pinched out into a strong keel which continues to the aperture as in the typical race; growth-lines coarse and spiral sculpturing *strongly* developed in both young and adult, especially on the base; young shells ornamented with *conspicuous* periostracal excrescences or fringings in connection with the spiral sculpture and about the periphery.

*Measurements.*—Caliper-measurements of seven mature shells are as follows:—

| | Maximum diameter. | Minimum diameter. | Altitude. | Diameter of umbilicus. | Number of whorls. |
|---|---|---|---|---|---|
| | mm. | mm. | mm. | mm. | |
| Paratype.. | 16·1 | 13·7 | 7·6 | 4·3 | [illegible] |
| Paratype. | 15·4 | 13·7 | 9·2 | 4·0 | 5⅛ |
| Type ... | 14·4 | 12·4 | 7·0 | 3·8 | 5⅛ |
| Paratype. | 14·2 | 13·0 | 7·6 | 3·6 | 5⅛ |
| Paratype. | 14·1 | 12·3 | 6·7 | 3·7 | 5⅛ |
| Paratype. | 13·7 | 12·1 | 7·5 | 3·5 | 5 |
| Paratype. | 13·7 | 12·1 | 7·0 | 3·3 | 5 |

*Type.*—Cat. No. 7186 of the author's collection. Paratypes No. 6314 of the same collection; others to be deposited in the collections of the Academy of Natural Sciences of Philadelphia, the San Diego Museum, the British Museum (Natural History), and the private collection of Mr. Allyn G. Smith.

Fig. 6. Fig. 7.



*Oreohelix handi jaegeri*, subsp. n., type-specimen.

*Type-locality.*—Alt. 7500 ft., detrital ridge west of Griffith's Hotel, Charleston Mts., Nevada; found living in some numbers, Edmund C. Jaeger coll., June 20, 1927, 5 Oct., 1927, and July 1928.

*Remarks.*—This handsome race, distinguished by a bulk several times that of even the largest individuals of the typical form, together with a remarkable development of the spiral ornamentation, can hardly be referred satisfactorily to *handi*, s. s., and is, therefore, here given the name of its discoverer. Just why the snail-colonies of the ridge west of the hotel and those inhabiting the apparently higher elevations to the southward should differ so strikingly, and precisely what relation the two races discriminated may accordingly bear to one another, are problems which remain to be worked out.

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——. 1916. "Notes on the Anatomy of *Oreohelix*, with a Catalogue of the Species." Proceedings Academy Natural Sciences Philadelphia, 1916, pp. 340–359, text-fig. 1, pls. xix.–xxii. (June 1916).

——. 1917. "Notes on the Anatomy of *Oreohelix*. II." Proceedings Academy Natural Sciences Philadelphia, 1917, pp. 42–46, text-figs. 1–4 (March 1917).

PILSBRY, H. A., & FERRISS, J. H. 1918. "New Land Shells from California and Nevada." 'Nautilus,' xxxi. pp. 93–95 (Jan 1918).

## XIII.—*On the Genus* Damaromyia, *Kertesz* (Stratiomyiidæ). By G. H. HARDY, Walter and Eliza Hall Fellow in Economic Biology, Queensland University, Brisbane.

THE material upon which this study is based consists of over one hundred specimens belonging to more than twelve species. For the loan of the twenty-four specimens in the Ferguson Collection I am indebted to Prof. Harvey Sutton, Director of the School of Public Health and Tropical Medicine, and also to Mr. F. H. Taylor, under whose immediate charge the Ferguson Collection is placed. Mr. A. Musgrave, of the Australian Museum, has checked the characters of the two types in his charge, and he has kindly supplied me with sketches of their frontal characters executed by Miss Joyce Allen. For this aid I am especially grateful, as it allowed me to establish more adequately the identity of the two species I had previously described.

### Genus DAMAROMYIA, Kertesz.

*Damaromyia*, Kertesz, Ann. Mag. Nat. Hung. xiv. pp. 195–6 (1916).
*Pachygaster*, Hardy, Proc. Roy. Soc. Tasmania, 1918, p. 63 (1917), and 1920, p. 43; Hardy, Rec. Aust. Mus. xiii. p. 193 (1922); Malloch, Proc. Linn. Soc. N.S. Wales, liii. p. 366 (1928).

*Status.*—This genus is one of the Pachygasterini group, and when establishing it Kertesz made several errors, the most significant of which relates to sex; his specimen was a female, not a male. Hitherto the specimens in Australia have gone under the name *Pachygaster*, but that genus is a very large one, and is capable of subdivision. Kertesz's attempt to subdivide the genus is not likely to be fully accepted, for it would appear that he gave to many specific characters the importance of a generic status. On this account it is not certain that *Damaromyia* is the first name to be applied to one of the present group; and, when properly understood, the genus *Adraga*, Walker, may be found to be identical. In the meanwhile, Kertesz's name *Damaromyia* is the only one certainly applicable to the Australian species.

*Characters.*—The genus is rather near to *Pachygaster* (*sensu stricto*), but differs in having the scutellum granulated along its apical margin and the radio-median cross-vein reduced to a point. The radial vein has its branch complete, and there are no outstanding characters such as are features of so many allied genera proposed by Kertesz.

In addition to the above, all the following species have the head, thorax, and scutellum, excluding appendages, black. The frons is provided with a carina reaching from the ocellar tubercle towards the frontal ridge, but varying in extent. From the frontal ridge down each side of the antennæ, and often down each side of the oral cavity, there is an abundance of silvery pubescence. The frons offers characters of value for specific determination, and, in addition, the shape of the scutellum and the nature of the punctures over the body or, in more applicable terms, the nature and density of the hair-pits with which the body is more or less densely studded, offer excellent characters for the determinations of the specific identity of the females. The frons of the male is very much reduced, or even the eyes may be contiguous, so that this sex can be identified at present only by some other character, or combination of characters, that may be found unique to the species.

In the following descriptions the measurements of the width of the frons, compared with that of the head, are made with an eye-piece micrometer, and they are taken at about halfway between the ocellar tubercle and the frontal ridge; the numerical values thus measured are reduced to either five or six for the frons measurement. The formula is built up by placing the width of the eye on each side of that of the frons; for example, in *D. depressa* the measurements work out for the eye-frons-eye to 9 : 6 : 9. The sum of these three figures gives 24 for the total head-width and 6 for the frons, so that the frons is thus found to be one-quarter of the total head-width. On some species the measurements do not work out quite as conveniently; nevertheless, the approximate width of the frons is quoted in fractions that can be readily grasped by a rough eye-measurement.

## *Key to Species of* Damaromyia.

| | | |
|---|---|---|
| 1. | Scutellum lying in the same plane as that of the thorax | 2. |
| | Scutellum raised to an angle at least 15 degrees to that of the thorax | 10. |
| 2. | Frons with a broad depression reaching from eye to eye, but the carina may traverse this and divide it into two elongate depressions | 3. |
| | Frons with either a small median depression that is scarcely as wide as long, or entirely without one | 5. |
| 3. | Frons converging, 1/4th head-width; depression without interruption; hair-pits widely scattered and evenly distributed. Scutellum semicircular | *depressa*, sp. n. |
| | Frons less than 1/4th head-width. Scutellum triangular | 4. |
| 4. | Frons distinctly converging, about 1/5th head-width, and without interruption of the broad depression; with numerous hair-pits four abreast, covering the area each side of the carina | *discolor*, sp. n. |
| | Frons very slightly converging, about 1/6th head-width, and the depression completely divided by the carina; hair-pits plentiful, lying two abreast | *bifossa*, sp. n. |
| 5. | Frons with a median depression; frons 1/5th to 1/6th head-width | 6. |
| | Frons without a depression, 1/4th of head-width or more; hair-pits plentiful. Scutellum with one marginal depression. | *hirsuta*, sp. n. |
| 6. | Scutellum more or less semicircular, but always with two marginal depressions. Hair-pits of frons widely scattered, about two abreast | 7. |
| | Scutellum triangular, with only one marginal depression. Frons with hair-pits densely packed, two to four abreast | 9. |
| 7. | Abdomen rather sparsely covered with hair-pits. Both thorax and scutellum with few, unusually small, hair-pits, these being evenly and sparsely distributed over these areas | *nitens*, Hardy. |
| | Abdomen densely covered with hair-pits | 8. |
| 8. | Thorax and scutellum with small and uniformly distributed hair-pits. Carina without a median groove. Legs entirely reddish yellow | *confusa*, sp. n. |
| | Thorax with normal-size hair-pits, grading in density to the scutellum, where they are of normal density. Carina with a conspicuous median groove. Legs largely black | *tasmanica*, Kertesz. |
| 9. | Frons with hair-pits each side of the carina three and four abreast | *trina*, sp. n. |

| | | |
|---|---|---|
| | Frons with hair-pits each side of the carina only two abreast, but somewhat irregularly spaced | *whitei*, Hardy. |
| 10. | Scutellum raised to an angle of about 15 degrees with that of the thorax, with one marginal depression | 11. |
| | Scutellum raised to an angle of about 30 degrees with that of the thorax; without a margined depression. Frons parallel-sided and gabous; 1/4th head-width, and with few inconspicuous widely-scattered hair-pits | *clivosa*, sp. n. |
| 11. | Frons parallel-sided, 1/4th head-width, slightly depressed near apex of carina, and with scattered hair-pits lying two abreast | *limbipuncta*, sp. n. |
| | Frons converging, 1/5th head-width, and with irregularly-distributed hair-pits, a group being packed near each side of the ocellar tubercle | *racemipunctata*, sp. n. |

## *Damaromyia depressa*, sp. n.

Female: frons slightly converging, 1/4th head-width, with the anterior half of that portion above the frontal ridge strongly depressed; this depression reaches from eye to eye. The carina runs to about two-thirds the length of that depression, and each side of it are widely scattered hair-pits, unevenly distributed, more being found adjacent to the carina than elsewhere. The depression of the frons affects the level of the eye-facets, for those near it are slightly depressed. The eyes are wide apart, so that the eye-frons-eye formula is 9 : 6 : 9.

The thorax, scutellum, and abdomen have their hair-pits less dense than usual, giving the species a shining appearance. The scutellum lies in the same plane as that of the thorax, is semicircular, and has one well-marked marginal depression. Legs entirely black.

*Hab.* Queensland: Brisbane, November 1928, 2 females.

## *Damaromyia discolor*, sp. n.

Female: frons distinctly converging, about 1/5th head-width, with a broad depression on the anterior third of that portion above the frontal ridge, and reaching from eye to eye. Each side of the carina, which extends into the depression, are many hair-pits, rather densely packed, three and four abreast, covering the whole area. The ocellar tubercle also has hair-pits on it, which is unusual. The eye-frons-eye formula is 9 : 5 : 9.

The thorax, scutellum, and abdomen are densely covered with hair-pits; the two former have the hair within the hair-pits longer than usual and golden yellow, giving the general appearance of discoloration over these areas. The scutellum lies in the same plane as that of the thorax, is triangular, and has one marginal depression. Legs yellowish.

*Hab.* Queensland: Brisbane, October 1928, 1 female (holotype); National Park, March 1929, 3 females (*A. J. Turner*).

### *Damaromyia bifossa*, sp. n.

Female: frons slightly converging, about 1/6th head-width, and strongly depressed for about half the length above the frontal ridge. This depression reaches from eye to eye, but it is traversed by the carina, which divides it into two elongate cavities. The hair-pits are plentiful, rather uniformly distributed throughout the length of the frons, extending into the above-mentioned cavities, and they lie about two abreast, well away from the carina. The eye-frons-eye formula is 14 : 5 : 14.

The thorax, scutellum, and abdomen are densely covered with hair-pits. The scutellum lies in the same plane as that of the thorax, is triangular, and has one depression bordering its apical margin.

*Hab.* Queensland: Brisbane, September to November 1924, 1925, and 1928, 3 females.

### *Damaromyia hirsuta*, sp. n.

Female: the frons is about 1/4th head-width, densely covered with hair-pits, within which the hairs are much longer than usual, this giving it a very shaggy appearance. The eye-frons-eye formula is 7 : 5 : 7. The thorax, scutellum, and abdomen are densely covered with hair-pits. The scutellum lies in the same plane as that of the thorax, is short and somewhat semicircular, with a well-defined marginal depression. The legs are yellowish.

*Hab.* Queensland: Brisbane, the holotype, August 1929, 1 female, and another without date.

*Note.*—There are two other species known that run to this one in the key. The frons on these does not have the shaggy nature, and differs in width, whilst the hair-pits do not quite cover it. One good specimen and one damaged, from Brisbane, have the scutellum of the same shape, and the legs are stained with black. A unique specimen in the Ferguson Collection, from Sydney, has an elongate scutellum, and is undoubtedly distinct.

### *Damaromyia nitens*, Hardy.

*Pachygaster nitens*, Hardy, Rec. Aust. Mus. xiii. p. 194 (1922).

Female: frons 1/6th head-width and with a median depression at the apex of the carina; on each side of the latter are widely-scattered hair-pits. The frons is parallel-sided, and the eye-frons-eye formula is 15 : 6 : 15.

The thorax and scutellum are more shining than in any of the allied species, this being due to the very few and small evenly-spaced hair-pits on these areas. The abdomen has the hair-pits much less than usual, but of larger size than those of the thorax. The scutellum lies in the same plane as that of the thorax, is semicircular, and has two marginal depressions. Legs black, with yellowish tarsi.

Male: agrees with the female, and has the eyes approximate, the frons being about twice as wide at the ocellar tubercle than it is near the frontal ridge.

*Hab.* Queensland: National Park, March 1929, 2 females taken by Dr. A. J. Turner. New South Wales: a male, bearing on the label, " Sydney, N.S.W.: W. W. Froggatt" in print, and "Brookland, 15.11.1925" in writing. Also a pupal skin is mounted with it. The identity of the male was recognized before reaching me, the name being attached, apparently, by the late Dr. E. W. Ferguson; this specimen, the allotype, is in the Ferguson Collection.

### *Damaromyia confusa*, sp. n.

Female: frons about 1/6th head-width, converging, and with a median depression at apex of the carina; at each side of the latter are scattered hair-pits, at most two abreast. The eye-frons-eye formula is 14 : 5 : 14.

Thorax not so densely covered with hair-pits as in most cases, and therefore somewhat shining; including those of the scutellum, the hair-pits are rather small. The abdomen is densely covered with hair-pits. The scutellum lies in the same plane as that of the thorax, is rather semicircular, and has two marginal depressions; the shape of the scutellum comes between the semicircular and triangular forms. Legs entirely reddish yellow.

*Hab.* Queensland: Brisbane, November 1926, 2 females; Stanthorpe, 17 March, 1926, a female in Mr. F. A. Perkins's collections.

### *Damaromyia tasmanica*, Kertesz.

*Damaromyia tasmanica*, Kertesz, Ann. Mus. Nat. Hung. xiv. p. 197 (1916).

Female: frons 1/5th head-width, with parallel eye-margins and with a median depression at apex of the carina; on each side of the latter are very small hair-pits, scattered as in *D. confusa*, but much less perceptible. In this species the carina has a conspicuous median groove, which is unusual. The eye-frons-eye formula is 10 : 5 : 10.

Thorax with hair-pits that markedly increase in density towards the scutellum, on which they are of normal density. The abdomen is densely covered with hair-pits. The scutellum, lying in the same plane as the thorax, is semicircular, and has two marginal depressions. Legs largely black.

*Hab.* Tasmania: Dunalley, 29 January, 1918, 1 female (bears a label with "*P. whitei*, paratype"); Strahan, February 1924, 2 females. New South Wales: Roseville, 1 May, 1921, a female in the Ferguson Collection that was included in my paper of 1921 as being *P. whitei*. Queensland: Stanthorpe, 8 January, 1925, a female in the collection of Mr. F. A. Perkins.

*Note.*—The width of the frons given by Kertesz is 1/6th that of the head-width; nevertheless, the remaining characters agree so well that I consider there can be no doubt concerning the identity of the present form. Kertesz regarded his specimen as being a male; but this could hardly be the case, and I consider he made an error in that matter.

### *Damaromyia whitei*, Hardy.

*Pachygaster whitei*, Hardy, Proc. Roy. Soc. Tasmania, p. 44 (1920); Rec. Aust. Mus. xiii. p. 194 (1922).

Female: frons 1/6th the head-width, converging, and with a median depression at the apex of the carina; the hair-pits each side of the latter are only two abreast, compactly but somewhat irregularly placed adjacent to the carina. The eye-frons-eye formula is 13 : 5 : 13. In life the eyes are marked with one reddish bar above the centre of the otherwise greenish facets.

The thorax, scutellum, and abdomen are densely covered with hair-pits, and the scutellum lies in the same plane as that of the thorax, is triangular, and has one marginal depression. The legs are yellowish.

*Hab.* Queensland: Brisbane, March, August, October 1923, 1924, 1925, and 1929, 4 females; National Park, March 1929, 3 females (*A. J. Turner*); and in the Ferguson Collection, Eidsveld, 28 April, 1924, 3 females (*Bancroft*). New South Wales: Sydney, 15 November, 1923, 1 female in the Ferguson Collection.

*Note.*—The original type-series and certain other specimens, subsequently labelled as being *Pachygaster whitei*, form a complex containing the present species, *D. tasmanica*, *D. trina*, and *D. confusa*. Together with *D. nitens* they form a very homogeneous group within the genus.

### *Damaromyia trina*, sp. n.

Female: frons 1/6th head-width, converging, and with a median depression at the apex of the carina. The hair-pits are densely packed each side of the latter, lying three and four abreast. The frons-eye-frons formula is 13 : 6 : 13.

The thorax, scutellum, and abdomen are densely covered with hair-pits. The scutellum lies in the same plane as that of the thorax, is triangular, and has one marginal depression. The legs are yellowish.

Male: similar, but with the eyes approximate for a long distance.

*Hab.* Tasmania: New South Wales, Sydney, 30 October, 1924, 1 female; 3 November, 1923, 1 male; Maitland, 2 April, 1924, and Glemreagh, 25 January, 1923, 2 females; all in the Ferguson Collection. Queensland: Brisbane, May 1924 and October 1922, 2 females; April 1924 and November 1928, 2 males; National Park, March 1929, 1 female (*A. J. Turner*). A male and a female from Brisbane have the outline of the scutellum forming a Gothic arch, being strongly pointed at the apex instead of rounded.

### *Damaromyia limbipuncta*, sp. n.

Female: frons broad, about 1/4th head-width, parallel-sided, and with a few widely-scattered hair-pits, about two abreast, nearer to the broad carina than to the eyes. The carina traverses a shallow depression at its apex, which depression reaches from eye to eye, but is hardly to be distinguished from the low level of the frons each side of the carina. The eye-frons-eye formula is 9 : 6 : 9.

The thorax, scutellum, and abdomen are densely covered with hair-pits. The scutellum is set to lie in a plane about 15 degrees with that of the thorax, is triangular, and contains one marginal depression. The legs are yellowish.

Male: similar, but with the eyes contiguous for a long distance.

*Hab.* Tasmania: Hobart, January 1924, a pair taken in a cow-shed in a short road that leads to Macrobie's Gully.

### *Damaromyia racemipuncta*, sp. n.

Female: frons 1/5th head-width, converging, and the hair-pits are few and irregularly scattered, a group of about 15 being more closely packed each side near the ocellar tubercle. The eye-frons-eye formula is 10 : 5 : 10.

The thorax, scutellum, and abdomen are densely covered with hair-pits. The scutellum is triangular, and set to lie in a plane about 15 degrees with that of the thorax, and it has one marginal depression. The legs are yellowish.

Male: similar, but with a very narrow and converging frons that becomes approximate at the frontal ridge.

*Hab.* Queensland: Brisbane, October 1925, 1 female; September 1925, 1 male.

### *Damaromyia clivosa*, sp. n.

Female: frons parallel-sided, swollen, and about 1/4th the head-width; there are few inconspicuous hair-pits widely scattered on it. The carina is hardly perceptible. The eye-frons-eye formula is 8 : 5 : 8. The eye-marks, when alive, consist of a large reddish blotch covering the upper portion, and below this a reddish bar at about half the depth of the eye; elsewhere the eye is greenish.

The thorax, scutellum, and abdomen are densely covered with hair-pits. The scutellum is set to lie in a plane at 30 degrees to that of the thorax; it is triangular, and without a marginal depression. The legs are yellowish.

Male: similar; near the ocellar tubercle the eyes are rather far apart, but they are approximate above the frontal ridge, so that the frons is very narrow and converging.

*Hab.* Queensland: Brisbane, January, June, July, September to November 1924–1930, 33 females; National Park, March 1921, 1 female, and March 1929, 4 females (*A. J. Turner*). New South Wales: Sydney, January to April and October to December, 9 females and 5 males; Coramba–Dorrigo Road, 1000 feet (31.1.23), 1 female. All but two from this State are in the Ferguson Collection.

*Note.*—I can see no justification for regarding the angle at which the scutellum is set as being a matter of generic importance. It is found variable quite commonly in other genera of Stratiomyiidæ, including the allied genus *Lonchegaster*, where both forms again occur. *D. clivosa* seems to come nearest to the South American *Praomyia*, according to Kertesz's account of that genus.

## XIV.—Camponotus (Tanæmyrmex) britteni, *sp. n.* (*Hymenoptera*, Formicidæ), *a Formicine Ant new to Science.* By HORACE DONISTHORPE, F.Z.S., F.E.S., etc.

HAVING received a *Camponotus* (worker major) from Mr. H. Britten, of the Manchester Museum, which I was unable to determine, I sent it to Professor Menozzi, of Chiavari, who returned it to me as representing a new species, which I have described in the following paper.

The genus *Camponotus* is a very large one, over 1000 forms having been described. The species occur all over the world, with the exception of Great Britain and New Zealand. Their colonies are often very populous, and their nesting-habits are very variable. They nest in the ground and under stones, in dead and decayed wood, under bark, and in galls and hollow twigs, etc. Some build nests of carton, and a few utilize their larvæ to spin silk to fasten together vegetable refuse, etc., as is the case in the genera *Œcophylla* and *Polyrhachis*. Their feeding-habits are also variable, as they prey on other insects, but also suck the excreta of aphids, the nectar of plants, etc. One of the largest ants in the world, *Camponotus* (*Dinomyrmex*) *gigas*, Latr., belongs to this genus.

As this immense genus became too unwieldy to deal with, various attempts have been made to try to simplify matters. In 1896 Emery divided the large number of species into some 26 groups. Later, Forel, in 1912, divided the genus into 20 subgenera. Unfortunately, however, he failed to designate types for these, and consequently, in 1913, Wheeler proceeded to supply this want. In 1914 Forel published a list of all the species known at that date, adding several new subgenera. He cited a type for each of the subgenera, but without consulting Wheeler's previous designations! Emery, in 1920, published a revised classification of the genus, but also overlooked Wheeler's designation of types. Wheeler, in 1921, was therefore obliged to propose a number of new subgeneric names. In 1921 Santschi slightly revised the genus, and created a few more subgenera. In the 'Genera Insectorum' (1925) Emery lists and defines some 38 subgenera. Finally, in 1926, Santschi somewhat modifies Emery's conclusions, and adds a few more subgenera.

### *Camponotus* (*Tanæmyrmex*) *britteni*, sp. n.

*Worker major.*—Head and prothorax light chestnut-brown, mandibles shining black, mesothorax and epinotum reddish brown, scale, first two segments of gaster, and articulations at base of legs golden yellow, base of second segment and following segments blackish, antennæ and legs dark brown, tips of antennæ, spurs, and tarsi pale red. Whole body furnished with scattered long golden hairs which are set in raised pores and are thickest on prothorax and gaster, decumbent fine golden-grey pubescence, most conspicuous on the sides of the thorax, and little, scattered, short, decumbent golden hairs, most noticeable on the cheeks and gaster.

*Head* triangular, broadest behind eyes but before occiput, somewhat excised posteriorly, very finely and transversely reticulate; *mandibles* armed with six teeth, the three apical ones longer than the rest, fifth longer than fourth, and sixth still longer than fifth, very finely reticulate, with larger and smaller scattered punctures; *clypeus* broadest at apex, narrowed to base, anterior border produced and emarginate in middle, distinctly carinate, with sharp pointed anterior angles, and a shallow fovea on each side between anterior angles and produced border; *frontal area* distinct, *frontal carinæ* long, reaching to beyond middle of eyes, converging in front and behind with raised edges, *frontal furrow* distinct, but not extending back as far as base of frontal carinæ; *eyes* large, oval; *ocelli* wanting; *antennæ* moderate; *scapes* extending beyond occipital border by barely twice their thickness. *Thorax* longer than broad, considerably narrower than base of head, and slightly more finely transversely reticulate; *pronotum* about as long as broad, narrowed in front, considerably rounded at sides, broadest behind middle, narrowly margined; *mesonotum* about as long as broad; *metanotum* very narrow, with rather feeble sutures; *epinotum* longer than broad, roundly arched, the dorsum slightly more so than the declivity; *scale* convex in front, concave behind, longer than broad, narrowed to apex laterally and transversely, and bluntly pointed at apex. *Gaster* longer than broad, finely transversely reticulate, more conspicuously so on basal margins, when visible, of second and third segments; the pores which bear the golden hairs appear to be more conspicuous on the gaster, and to have their anterior margins more raised. *Legs* moderate, *femora* and *tibiæ* compressed, the latter without spines beneath. *Long.* 7·5–9·5 mm.

*Worker minor.*—Colour, sculpture, and pilosity as in the major. *Head* longer than broad, subparallel, slightly broadest just before eyes, rounded to base, narrowed at occipital border; *clypeus* slightly more distinctly carinate and less abruptly produced in middle; *scapes* extending beyond the occipital border by half their length. *Thorax* much as in the major, but *metanotum* not visible; *scale* a little thicker in proportion; rest as in the major. *Long.* 5·5–6·5 mm.

Described from nine major and two minor workers sent to me by Mr. H. Britten, after whom the species is named. Captured by C. Hay Murray at Liverpool in April and May, 1930, on one of Messrs. Bibby Brothers' steamers in the wood-casing of the refrigerator chamber, to which they were causing considerable damage. Worker major and minor types in the British Museum Collection.

This species comes nearest to *Camponotus* (*Tanæmyrmex*) *nicobarensis*, Mayr (1865), and its varieties, which occur at the Nicobars, Cochin China, Burma, and Assam, but differs by being somewhat larger, with brighter colours, duller integument, by reason of the different puncturation, and the presence of the fine golden-grey pubescence. The flagellum in *nicobarensis* is yellow, and in the ☿ minor the head is somewhat longer in proportion and the general colour is yellow.

### LITERATURE.

1865. Mayr, G. 'Novara Reise,' Formicidæ, p. 31.
1896. Emery, C. Mem. Acad. Soc. Bologna (s. 5) v. pp. 761–80.
1912. Forel, A. Mem. Soc. Ent. Belg. xx. pp. 59–92.
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1921. Wheeler, W. M. 'Psyche,' xxviii. pp. 16–19.
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1922. Emery, C. 'Genera Insectorum,' *Formicinæ*.
1926. Santschi, F. Rev. Suisse Zool. xxxiii. pp. 597–618.

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## XV.—*Report on the Collembola collected by the Oxford University Expedition to Lapland*, 1930. By JAMES MEIKLE BROWN, B.Sc., F.L.S., F.E.S.

THE Collembola recorded in the present communication were obtained by the members of the Oxford University Expedition to Lapland in 1930. The material was contained in ten tubes, accompanied by the following notes on localities and habitats :—

257. Goeidnovuoppe, on the Kautokeino River. Freshwater marginal zone about drift-line, very wet, 29. vii. 30 (J. E. Duffield coll.).

258. As above, but from a zone slightly further from the water, under stones in an open plant-community on sand, 29. vii. 30 (J. E. Duffield coll.).

279. As 257, 30. vii. 30.

280. As 258, 30. vii. 30.

287. Mieron, 15 kilo. N. of Kautokeino, on the Kautokeino (=Alten) River. Under dry cow-dung in grass-land, 3. viii. 30 (J. E. Duffield coll.).

457. Bossekop, near Alta. Shaking lower branches of pine-trees near the sea, 9. viii. 30 (J. E. Duffield coll.).

618. Immerfoss, Upper Reisen Valley. Shaking lower branches of pine-trees, 10. viii. 30 (C. Elton coll.).

714. Punta, Upper Reisen Valley. Abundant on horse-dung in hay-meadow with open birch-wood, 15. viii. 30 (T. H. Harrison coll.).

733. Same place as 714. Beating branches of pine-trees in pure pine-wood, 20. viii. 30 (C. Elton coll.).

F. 66. Mieron, 15 kilo. N. of Kautokeino, on the Kautokeino River. On damp surface among moss and *Carex*, just above drift-line of river, on sand, 2. viii. 30 (C. Elton coll.).

F. 67. Same locality and date. In rotten birch-stump near village, in touchwood (C. Elton coll.).

F. 69. Mierovarre, near Mieron. In very old dry winter-nest of lemming (*Lemmus lemmus*), among *Carex*, c. 1650 feet, 3. viii. 30 (C. Elton coll.).

F. 70. Ditto, another nest (C. Elton coll.).

F. 171 Punta, Reisendal, 19. viii. 30. On dead *Evotomys* in a trap, in birch-wood, river-level (C. Elton coll.).

All these localities are either in Finmark Province or Tromso Province, North Norway.

Sixteen species and varieties are represented, and while a number of these are common and widely distributed, one species appears to be undescribed and four others are not included in the list of twenty-nine species recorded by Ågren in his paper on "Lappländische Collembolen" (Arkiv f. Zool. Bd. lxxxviii. H. 1, 1904), which appears to contain the most complete account of the Collembola of Lapland so far published.

My best thanks are due to Mr. Charles Elton for giving me the opportunity of examining this interesting collection.

## LIST OF SPECIES COLLECTED.

## Order COLLEMBOLA, Lubb.

### Suborder ARTHROPLEONA, Börn.

### Family Hypogastruridæ, Börn.

### 1. *Hypogastrura armata* (Nic.).

1841. *Podura armata*, Nicolet, Nouv. Mém. Soc. Helv. Sci. Nat. p. 57.
1871. *Achorutes armatus*, Tullberg, Öfv. Kongl. Vet.-Akad. Förhandl. i. p. 153.
1904. *Achorutes armatus*, Ågren, Arkiv f. Zool. p. 2.

*Locality*.—Three specimens, Mieron, on the Kautokeino River, 3. viii. 30 (*J. E. Duffield*) ; no. 287.

This is a common and widely distributed species, and is practically ubiquitous, extending from the Arctic Regions to New Zealand. It usually occurs on the ground under stones and other objects.

### 2. *Hypogastrura lapponica* (Axels.).

1902. *Achorutes lapponicus*, Axelson, Medd. Soc. pro F. et Fl. Fenn. p. 105.
1904. *Achorutes lapponicus*, Ågren, Arkiv f. Zool. p. 8.

*Locality.*—Six specimens, Mieron, on the Kautokeino River, 2. viii. 30 (*C. Elton*) ; no. F. 67.

This species seems to be restricted in its distribution to the north as an Arctic and Subarctic species, occurring so far as is known in Finland and Lapland. It is found chiefly under bark.

## Family Isotomidæ, Börn.

### 3. *Anurophorus laricis*, Nic.

1841. *Anurophorus laricis*, Nicolet, Nouv. Mém. Soc. Helv. Scienc. Nat. p. 53.
1904. *Anurophorus laricis*, Ågren, Arkiv f. Zool. p. 14.

*Locality.*—Three specimens, Mierovarre, near Mieron, 2. viii. 30 (*C. Elton*) ; no. F. 69.

This is another northern species, occurring in Northern Europe, Siberia, and North America. It is most often found under bark, especially that of conifers.

### 4. *Tetracanthella wahlgreni*, Axels.

1899. *Tetracanthella pilosa*, Wahlgren, Öfv. Kongl. Vet.-Akad. Förhandl. p. 336.
1907. *Tetracanthella wahlgreni*, Axelson, Acta Soc. Scient. Fenn. xxxiv. p. 129.

*Locality.*—Three specimens, Mierovarre, near Mieron, 3. viii. 30 (*C. Elton*) ; no. F. 69.

This is an Arctic and Subarctic species, having been obtained in Spitzbergen, Bear Island, Norway, and Sweden. It is chiefly a ground-species, occurring in moss and under stones.

### 5. *Folsomia quadrioculata* (Tullb.).

1871. *Isotoma quadrioculata*, Tullberg, Öfv. Kongl. Vet.-Akad. Förhandl. p. 152.
1904. *Isotoma quadrioculata*, Ågren, Arkiv f. Zool. p. 21.

*Locality.*—One specimen, Mieron, on the Kautokeino River, 2. viii. 30 (*C. Elton*) ; no. F. 67.

Ten specimens, Mierovarre, near Mieron, 3. viii. 30 (*C. Elton*) ; no. F. 69.

A small inconspicuous species, but widely distributed in the Northern Hemisphere. It is found most often under bark, in moss, or in humus.

### 6. *Proisotoma minuta* (Tullb.).

1871. *Isotoma minuta*, Tullberg, Öfv. Kongl. Vet.-Akad. Förhandl. p. 152.
1907. *Proisotoma minuta*, Axelson, Acta Soc. Scient. Fenn. p. 21.

*Locality.*—One specimen, Mierovarre, near Mieron, 3. viii. 30 (*C. Elton*); no. F. 70.

The single specimen showed a slight abnormality, in that the subapical (outer) tooth of the left mucro was itself two-pointed (see fig. 1).

### 7. *Proisotoma* (*Isotomina*) *lapponica*, sp. n.

Colour (in spirit) greenish, the spring and legs paler, a faint dorsal longitudinal stripe on the abdomen, the posterior borders of the abdominal segments, and almost the entire posterior segment bluish. Eye-patches very dark, a spot between the antennal bases and a delicate Y-shaped mark on the posterior region of the head dark. Antennæ, especially towards the apex, bluish.

Body with sparsely scattered, short, simple, almost straight and not adpressed hairs, of uniform length except for a very few slightly longer ones on the posterior segment of the abdomen. Hairs on the legs similar.

Antennæ slightly longer than the head, as 11 : 8. The apical segment distinctly the longest. The relative lengths of the segments approximately as 10·5 : 6 : 4. Antennal segment iv. without specialized olfactory hairs, and antennal organ iii. typical.

Eyes eight on each side of the head, of uniform size. Postantennal organ almost circular and only little larger than an ommatidium, about 1½ times (see fig. 2).

Legs without tenent-hairs and the claws without teeth. Empodial appendage rather longer than one half the claw, the inner lamella rounded but without an angle-tooth, the outer lamella gradually narrowing to the pointed apex (see fig. 3).

Fork not quite reaching to the ventral tube. Manubrium with a few scattered hairs dorsally and ventrally. Dentes about twice the length of the manubrium, slightly curved and dorsally ringed, with a few erect dorso-lateral hairs and numerous adpressed ventral ones. Mucrones with three teeth, the apical and anteapical large and of similar size, with an outer basal tooth very small and narrow (see fig. 4). Tenaculum with four barbs on the rami and one strong bristle on the corpus (see fig. 5).

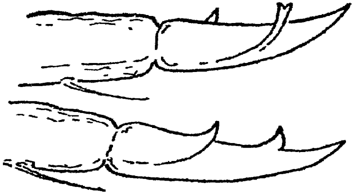


Fig. 1.

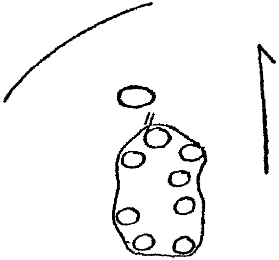


Fig. 2.

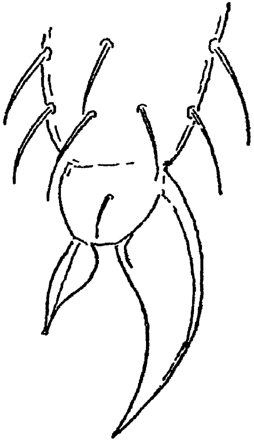


Fig. 3.

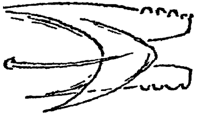


Fig. 5.

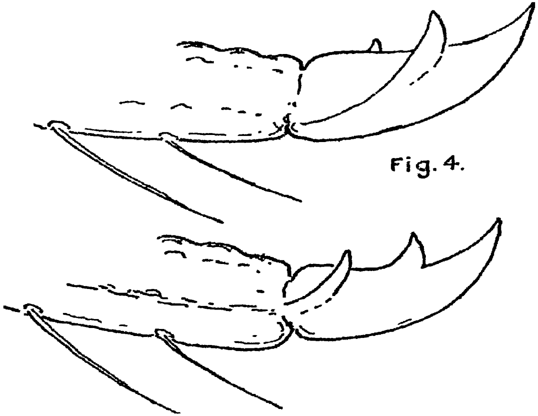


Fig. 4.

Fig. 1.—*Proisotoma minuta.* Mucrones of fork, showing abnormal tooth.
Fig. 2.—*Proisotoma lapponica,* sp. n. Eye-patch and postantennal organ.
Fig. 3.—Ditto. Apex of leg, showing claw and empodial appendage.
Fig. 4.—Ditto. Mucrones of fork, showing teeth.
Fig. 5.—Ditto. Tenaculum, seen from the ventral surface.

Abdominal segment iv. slightly longer than iii., approximately as 6 : 5. Segments v. and vi. combined.

Size ·8 mm.

*Locality.*—Mieron. On the damp surface among moss and *Carex*, just above the drift-line, on sand, 2. viii. 30 (*C. Elton*); no. F. 66.

Unfortunately one specimen only was present. It is more strongly pigmented than is usual in the genus, but the longer abdominal segment iv. points to its inclusion in the genus *Proisotoma*, while the combined segments v. and vi. place it in Börner's subgenus *Isotomina*. The present species has points of resemblance to *P. minuta*, Tullb., and *P. ripicola*, Linnan., but can readily be separated by the form and size of the postantennal organ, the spring, and leg-structure.

### 8. *Isotoma* (*Vertagopus*) *westerlundi*, Reut.

1897. *Isotoma westerlundi*, Reuter, Medd. Soc. F. et. Fl. Fenn. xxiii. p. 45.

*Locality.*—Ten specimens, Bossekop, near Alta, 9. viii. 30 (*J. E. Duffield*); no. 457. One specimen, Punta, Upper Reisen Valley, 20. viii. 30 (*C. Elton*); no. 733.

This species was not recorded by Ågren, but has occurred in Scandinavia, Finland, and Switzerland. In these localities it is typically a winter species, frequently occurring in the snow, but also under the bark of trees. The var. *sarekensis* (Wahlgr.) has been taken in Kemi-Lappmark among snow in winter.

### 9. *Isotoma viridis*, Bourl.

1837. *Isotoma viridis*, Bourlet, Mém. Soc. des Sc. de l'Agricult. de Lille, p. 401.

1904. *Isotoma viridis*, Ågren, Arkiv f. Zool. p. 17.

Forma *principalis*.

*Locality.*—One specimen, Goeidnovuoppe, on the Kautokeino River, 30. vii. 30 (*J. E. Duffield*); no. 280. One adult and two immature specimens, Mierovarre, near Mieron, 3. viii. 30 (*C. Elton*); no. F. 69. One specimen, Mieron, 2. viii. 30 (*C. Elton*); no. F. 67.

Forma *riparia* (Nic.).

1841. *Desoria riparia*, Nicolet, Nouv. Mém. Soc. Helv. Sci. Nat. p. 62.

*Locality.*—Numerous specimens, Goeidnovuoppe, on the Kautokeino River, 29. vii. 30 (*J. E. Duffield*); no. 257. Three specimens, Goeidnovuoppe, 30. vii. 30 (*J. E. Duffield*); no. 279. Three specimens, Goeidnovuoppe, 29. vii. 30 (*J. E.

*Duffield*); no. 258. One specimen, Goeidnovuoppe, 30. vii. 30 (*J. E. Duffield*); no 280. Numerous specimens, Mieron, on the Kautokeino River, 2. viii. 30 (*C. Elton*); no. F. 66.

*Isotoma viridis* is one of the commonest species of Collembola found in the Northern Hemisphere, occurring most often on the ground. The forma *riparia* is more abundant in the damper places by stream sides and the margins of pools and in swamps. In the present collection this form was more plentiful than the type, the larger individuals, reaching 3 mm. in length, having the dark markings very conspicuous, while smaller and more immature examples were considerably paler.

### 10. *Isotoma violacea*, Tullb.

1876. *Isotoma violacea*, Tullberg, Öfv. Kongl. Sv. Vet.-Akad. Förhandl. p. 36.
1904. *Isotoma violacea*, Ågren, Arkiv f. Zool. p. 14.

*Locality.*—Two specimens, Mieron, on the Kautokeino River, 2. viii. 30 (*C. Elton*); no. F. 67.

Two small specimens appear to be immature individuals belonging to this species.

### 11. *Isotoma olivacea* (Tullb.), var *grisescens* (Schäff.).

1896. *Isotoma grisescens*, Schäffer, Mitth. aus d. Naturhist. Mus. Hamb. xiii. p. 188.

*Locality.*—Two small specimens, Mierovarre, 3. viii. 30 (*C. Elton*); no. F. 69.

## Family Entomobryidæ, Börn.

### 12. *Entomobrya nivalis*, L.

1758. *Podura nivalis*, Linné, Syst. Nat. Ed. x. t. 1, p. 609.
1904. *Entomobrya nivalis*, Ågren, Arkiv f. Zool. p. 22.

*Locality.*—Seven specimens, Punta, Upper Reisen Valley, 20. viii. 30 (*C. Elton*); no. 733. Three specimens, Immerfoss, Upper Reisen Valley, 10. viii. 30 (*C. Elton*); no. 618.

This is another common and widely distributed species, very frequently found running over the trunks of trees, but also occurring under loose bark.

### 13. *Entomobrya marginata* (Tullb.).

1871. *Degeeria marginata*, Tullberg, Öfv. Kongl. Vet.-Akad. Förhandl. i. p. 148.
1904. *Entomobrya marginata*, Ågren, Arkiv f. Zool. p. 23.

*Locality.*—Numerous specimens, Meiron, on the Kautokeino River, 2. viii. 30 (*C. Elton*); no. F. 67.

This species is most often found under bark, less often on the ground under stones. It occurs in north and mid-Europe and North America.

### 14. *Lepidocyrtus lanuginosus* (Gmel.), Tullb.

1872. *Lepidocyrtus lanuginosus,* Tullberg, Kongl. Sv. Vet.-Akad. Handl. p. 38.

*Locality.*—One specimen, Mieron, 2. viii. 30 (*C. Elton*); no. F. 67.

Var. *fucata* (Uzel).

1890. *Lepidocyrtus fucatus,* Uzel, Thysanura Bohemicæ, p. 52.
1904. *Lepidocyrtus lanuginosus,* forma *fucata,* Ågren, Arkiv f. Zool. p. 24.

*Locality.*—Three specimens, Punta, Upper Reisen Valley, 15. viii. 30 (*T. H. Harrison*); no. 714. One specimen, Punta, Reisendal, 19. viii. 30 (*C. Elton*); no. 171. One adult and two immature specimens, Mierovarre, near Mieron, 3. viii. 30 (*C. Elton*); no. F. 70.

*Lepidocyrtus lanuginosus* is also a widely distributed species in the Northern Hemisphere, occurring principally on the ground under stone and in similar situations. The var. *fucata* differs from the type chiefly in the presence of patches of dark pigment on the sides of the fourth segment of the abdomen. Most of the specimens in this collection belong to the variety.

## DISTRIBUTIONAL AND ECOLOGICAL NOTE.

As has been mentioned above, several of the species here recorded are common and widely distributed, one (*H. armata*) extending as far south as New Zealand, and occurring in most countries where Collembola have been collected. The remainder appear to be restricted to the Northern Hemisphere, chiefly to the Palæarctic Region. Five species, viz., *H. lapponica*, *T. wahlgreni*, *P. lapponicus*, *I. westerlundi*, and *A. laricis* are truly boreal forms, the first four being confined, so far as is known, to the Arctic or Subarctic Regions, while *A. laricis* extends further to the south, and occurs in Britain.

While most of the tubes contained one or two species only, nos. F. 67 and F. 69 are more interesting. In F. 67, taken from a rotten birch-stump, we have an association of typical subcortical species, including *Hypogastrura lapponica, Folsomia 4-oculata, Isotoma violacea, Entomobrya marginata, Lepidocyrtus lanuginosus, Isotoma viridis,* although the last two also occur very commonly on the ground and *F. 4-oculata* frequents moss and humus as well.

F. 69, taken from a disused nest of the lemming, includes species most often taken from under stones and other objects on the ground, or from humus, such as *Tetracanthella wahlgreni, Folsomia 4-oculata, Isotoma viridis, Isotoma olivacea, Lepidocyrtus lanuginosus,* but includes also the subcortical species *Anurophorus laricis.*

## XVI.—*Note on Chimæroid Fish Remains from the Australian Tertiaries.* By Fredk. Chapman, A.L.S., F.G.S., &c.

In the November number of this Magazine the well-known Australian Chimæroid fossil, *Edaphodon sweeti*, was re-described by Sir Arthur Smith Woodward and Dr. White as *Chimæra anomala.*

The original description was given by Chapman and Pritchard in 1907 (Proc. Roy. Soc. Vict. vol. xx. pt. i. p. 61, and figured on pl. v.). The figure 5 (palatine, not "vomerine" as there stated in error) is practically identical with fig. 3 of Smith Woodward and White. Chapman and Cudmore have also further described and figured the Beaumaris species in 1924 (Proc. R. Soc. Vict. vol. xxxvi. pt. ii. p. 141, pl. xi. figs. 38, 39). *E. sweeti* is also referred to in 'Australasian Fossils' (Chapman, 1914) on p. 271. Besides the Beaumaris locality (not Beaumaris Bay), additional localities are Grange Burn, Hamilton, and Black Rock, Port Phillip, Victoria.

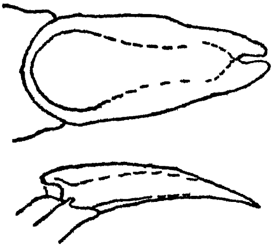
The original reference of this fossil to the genus *Edaphodon* was made after a close study of all previously described fossil tritors of Chimæroids, but it is quite possible that later investigations may throw further light on its relationships with genera other than *Edaphodon*, which, by the way, is more typically Eocene.

## XVII.—*A new* Adoretus (*Coleoptera*, Rutelidæ) *from Eastern Africa.* By Dr. F. Ohaus.

### *Adoretus marshalli*, sp. n.

*Ad. flaveolus*, Fåhr., proxime affinis. Oblongo-ellipticus, subparallelus, modice convexus; supra et subtus flavotestaceus, subnitidus, clipeo rufescente, capite fusconigro, supra et subtus æqualiter pilis brevibus albidis sparsis vestitus. Clipeus in ♀ regulariter semicircularis, in ♂ trapezoidalis, angulis rotundatis. Supra totus sat dense et fortiter foveolato-punctatus, punctorum margine anteriore paulo magis quam posteriore elevato, præsertim in capite et thorace. Elytra regulariter costulata, pone costas regulariter seriato-punctata, interstitiis irregulariter punctulata, punctis omnibus piligeris. Pygidium in ♂ verticale, paulo convexum, pilis erectis sat dense vestitum; in ♀ brevius obliquum, pilis basalibus et discalibus appressis, apicalibus longioribus erectis. Tibiæ anteriores fortiter tridentatæ. Antennarum clava in ♂ et ♀ stipite brevior.

Long. 8–9, lat. 4–4½ mm.



*Adoretus marshalli*, Ohs.

♂ ♀. Mashonaland: Salisbury, xi. 98, at light (*G. A. K. Marshall*); N. Chirinda, 1. xii. 09, 3800 ft. (*C. F. M. Swinnerton*). Tanganyika: Usangu Distr., 29. xi.–15. xii. 1910, 3500–4500 ft. (*S. A. Neave*); Ruaha River, 18–21. xii. 1910 (*S. A. Neave*); Usagara Distr., road to Kilossa, 22–26. xii. 1910, 1500–2500 ft. (*S. A. Neave*).

Type in the British Museum.

Closely allied to *Ad. flaveolus*, Fåhr., of the same colouring, but somewhat more convex and less broad in shape, the punctures coarser, while the hairs are somewhat finer and more densely set. On the elytra the three discal costæ bear no longer or thicker setæ. In the ædeagus (see figure) the sides of the paramera are equally convergent from base to tip, not abruptly convergent just before the tip as in *flaveolus*.

## BIBLIOGRAPHICAL NOTICE.

*The Note-Book of Edward Jenner in the Possession of the Royal College of Physicians of London; with an Introduction on Jenner's Work as a Naturalist.* By F. DAWTREY DREWITT, M.D., F.R.C.P. London: Oxford University Press (Humphrey Milford), 1931. Pp. 49; frontispiece. Price 3*s.* 6*d.* net.

THE MS. note-book of Edward Jenner, a small quarto volume of 80 pages, the entries in which were made at various times from 1787 to 1806, came into the possession of the Royal College of Physicians in 1888, and is now printed for the first time. It contains some observations on the habits of the cuckoo, the state of the ovaries and testes in a number of birds at various dates, and the food of certain birds as observed from an examination of the stomach contents; on the presence of hydatids in the bodies of various animals; and on distemper in dogs. The first part of the present small volume is taken up by an essay by Dr. F. Dawtrey Drewitt on Edward Jenner as a naturalist; Dr. Drewitt gives an interesting description of natural history studies in England in the latter half of the 18th century, and relates the story of Jenner's discovery of the mode in which the young cuckoo gets rid of its companions in the nest; he also gives an account of many of Jenner's other observations, and especially of those on the migration of birds (published in the Phil. Trans. 1824). An excellent photogravure reproduction of Sir Thomas Lawrence's portrait of Jenner forms a frontispiece to a volume which constitutes an interesting contribution to the history of science; the print, paper, and binding are all that can be desired. J. S.

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## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

February 20th, 1931.—Prof. E. J. Garwood, M.A., Sc.D., F.R.S., President, in the Chair.

The PRESIDENT in his Anniversary Address referred to the losses which the Society had sustained by the death of several eminent geologists, and paid tribute to the work of Pierre Termier, Foreign Member, and Joseph Felix Pompeckj, Foreign Correspondent. Among the Fellows recently deceased, he recalled the services of H. M. Ami, J. W. Evans, J. V. Elsden, H. W. Monckton, Sir Francis Grant Ogilvie, and B. B. Woodward.

In describing the Additions to our Knowledge of the Fossil Calcareous Algæ in the Pre-Cambrian and Palæozoic Rocks during the last 18 years, the PRESIDENT emphasized the value of these organisms as rock-formers, and their local use as zonal indices. Since 1913, much additional information regarding the distribution of these fossil plants had been collected from many parts of the world, more especially through the work of Rothpletz, Walcott, Pia, Madame Lemoine, Yabe, and Peterhans.

Previous to 1913, very few examples had been recorded from the Pre-Cambrian rocks, but Walcott's researches in the Algonkian of North America, and especially in the Newland Limestone of Montana, have brought to light a number of structures which contribute largely to the formation of these beds, and which he has attributed to algal growth. In the absence of definite cell-structures, he has classified them according to their general form. Holtedahl has compared them with the concretionary structures in the Magnesian Limestone of Durham.

Further examples of similar occurrences have been reported from the Huronian in several districts.

In Australia, Mawson and Madigan have called attention to certain structures in the Patakuurra Series in the McDonnell Ranges, which they compare with Walcott's genus *Collenia*.

In the Cambrian rocks, algæ, so far as is known, play only a subordinate part, but Bigot has recently described and figured certain nodular reefs from the base of the *Archæocyathus*-limestone of the Carteret district, and Walcott attributes *Cryptozoon proliferum* from the Hoyt limestone to the agency of algæ. He also describes species of *Sphærocodium*? from the Middle Cambrian (Burgess Shales) of British Columbia.

In Australia, Howchin and Mawson have recorded *Cryptozoon* from the Lower Cambrian of the McDonnell and Flinders Ranges, and *Girvanella*-limestones appear to be a feature of the Cambrian of South Australia and the Kimberley district. They have also been reported from the Cambrian of China and Manchuria, while species of *Epiphyton* have been described from the Cambrian of the Antarctic by Chapman and Gordon.

No new forms of importance have been recorded from Ordovician rocks, but Rothpletz in 1913 gave a fuller description of the algal deposits of Silurian age in Gotland.

Chapman has described a *Sphærocodium*-limestone from the Middle Devonian of Gippsland, and Mlle. Le Maitre one from the *Spirifer cultrijugatus*-beds of the north of France.

From the Lower Carboniferous, Prof. Kaisin has recorded *Solenopora*, *Mitcheldeania*, and *Ortonella* from the Dinantian, and Masloff has described *Girvanella*-beds from rocks of $D_3$ age in the Donetz Basin.

Pia has reported *Siphoniæ*, especially *Anthracoporella*, from the Southern Alps, and *Mizzia* from Dalmatia and Greece, which continue into the Permian.

Turning now to British deposits, not only has our knowledge of the distribution of calcareous algæ been considerably extended, but several interesting new occurrences have been recorded. Thus, *Solenopora compacta*, originally collected by Lapworth from the Caradoc beds on Hoare Edge, has been found to have a notable development near Frodesley and extending southward along the outcrop to Horderley, and to characterize a distinct zonal horizon. The prophecy made in 1913 that *Solenopora* would eventually be found in the British Silurian deposits has been amply fulfilled by the discovery of an important development with *S. gracilis* in the Woolhope Limestone of Old Radnor and Nash Scar, where this organism extends through 60 feet of limestone and contributes notably to the deposit. It is accompanied by rare specimens of *Sphærocodium gotlandicum.*

In the Lower Carboniferous rocks, the nodular *Girvanella* Band at the base of the $D_2$ sub-zone has been traced over a wide area, and has been fonnd useful for mapping the Oxford limestone in Northumberland. The most interesting recent discovery, however, is an important algal development in the Tuedian rocks of the Scottish Border and Mid-Northumberland, which is characterized by a luxuriant growth of *Mitcheldeania, Ortonella,* etc. These deposits extend over at least 1200 square miles, and constitute the most noteworthy algal development so far recorded in British Carboniferous rocks. In the Mesozoic, *Girvanella* and *Solenopora* re-appear in the Jurassic, but after the Corallian all traces of calcareous algæ disappear from the British deposits.

March 4th, 1931.—Prof. E. J. Garwood, M.A., Sc.D., F.R.S.,
President, in the Chair.

Dr. WILLIAM ARCHIBALD MACFADYEN, M.C., M.A., F.G.S., delivered a lecture on the Geology of British Somaliland.

The Somaliland Petroleum Company's expedition, including Mr. John A. Hunt and the lecturer as geologists, spent eighteen months in the country between 1928 and 1930. Some 100,000 square kilometres were mapped geologically for the first time, on the scale of 1 : 250,000.

The conception of the structure of the country, as described particularly by Prof. J. W. Gregory, was generally confirmed. The larger part consists of a great plateau sloping very gently to the south-south-east, fronted by a relatively low-lying area of broken surface-features and faulted strata. The plateau has been raised to a maximum observed height of 2400 metres along its northern edge, by faulting in the Gulf of Aden trend. Faulting in the Red Sea trend is widespread and of much importance; north to south faulting is rarer. All the faulting which has been mapped, and there is much of it, is of post-Middle Eocene age. Folding is almost absent.

The stratigraphy has been a particular object of study. Terrace gravels occur up to an altitude of 594 metres near Dagah Shabell, where they are best developed, and the river system of that district is a fine example of superimposed drainage.

Raised beaches are found in the Berbera district at levels of 8 metres, about 85 metres, and 200 metres; none is earlier than Pleistocene.

In the coast district, particularly south of Bulhar and along the Jibuti border in the west, are basalts and lavas, with the dissected volcano of Elmis; all are referred to Blanford's Aden Series, and are probably of Pliocene age and later.

The fragmentary Dubar Series, approximately of Burdigalian age, is restricted to the coastal district. It consists of limestone, shale, and grit, characterized by *Miogypsina*, and has a thickness up to about 150 metres.

The Daban Series, 2300 metres thick and resting conformably on the gypsum, occurs locally in the Guban country. It consists mainly of fresh-water lacustrine sands, clays, and a little limestone and gypsum, and contains plant-remains and silicified wood, and a small fauna with abundant ostracods and fish-remains. A highly fossiliferous marine intercalation near the base, the *Nautilus* Beds, is closely correlated with the Middle Eocene limestones to the east.

The south-eastern half of the country is covered by Eocene strata. Over the eastern part of the plateau outcrop the richly fossiliferous Middle Eocene limestones and marls, 230 metres thick. This is the latest deposit on the plateau, and is characterized by the foraminifera *Dictyoconoides kohaticus*, *Nummulites somaliensis*, and *N. discorbinus* var. *major*. Below this lies the anhydrite of the gypsum series, 350 metres thick, which often outcrops in great bare plains. In it are thin limestone partings frequently largely composed of an echinoid, *Sismondia polymorpha*. Next below lies the Lower Eocene limestone series, 400 metres thick. It is subdivisible by species of *Dictyoconoides*, *D. newboldi* occurring throughout, whilst *D. tipperi* is restricted to the upper part; this upper part is much thickened at Allahkajid, where the lower part, the Auradu Limestone, is missing.

The Eocene rests on Cretaceous Nubian Sandstone, up to about 2000 metres thick in parts of the Guban, where it includes the Shabell Beds, 830 metres of grits and red clays. The sandstone is very much thinner on the plateau, where, except in the north-east, it rests directly on the ancient floor. In the north-east it passes laterally into marine limestones.

Jurassic strata in faulted outcrops occur only north of the plateau, except in the north-east. A measured section 910 metres thick, showing the complete development near Bihendula, is found from the ammonite fauna to be mainly of Kimmeridgian age; only the uppermost 150 metres is later, while the basal 80 metres is earlier.

Adigrat Sandstone 200 metres in thickness, possibly of Triassic age, underlies the Jurassic at Bihendula; elsewhere, some shales are often interbedded.

The Inda Ad Series of ancient sedimentary rocks is only locally preserved, and the Adigrat Series generally rests directly on the floor of eroded Archæan igneous and metamorphic rocks; some of the latter were originally sediments.

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AND

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[TENTH SERIES.]

No. 44. AUGUST 1931.

## XVIII.—*New or little-known* Tipulidæ (*Diptera*).—XLIX. *Australasian Species.* By CHARLES P. ALEXANDER, Ph.D., F.E.S., Massachusetts Agricultural College, Amherst, Massachusetts, U.S.A.

THE crane-flies discussed at this time are Australian Hexatomine species, chiefly belonging to the genera *Limnophila* and *Gynoplistia*. As before, the great majority of the species were taken in New South Wales and Victoria by Mr. F. Erasmus Wilson, to whom all such types have been returned. Other material discussed herewith was taken by Mr. Tregellas and Miss Wood, in the Wilson Collection; by Messrs. Campbell, Hill, Tillyard, and Tonnoir, taken at and near Mt. Kosciusko, the types returned to Dr. Tonnoir; and by Mr. Mathews in West Australia and by Mr. Robinson in northern New South Wales, in the present writer's collection. I wish to express my deep thanks to all who have so efficiently co-operated in this study of the Australian Tipulidæ.

### *Epiphragma erasmi*, sp. n.

*Male.*—Length about 7–9 mm; wing 7–10 mm.

Allied to *Epiphragma hardyi*, Alexander (S. Queensland, N. New South Wales), in the characters of the numerous supernumerary cross-veins and spurs in cell *C* and the presence of three dark rings on all the tibiæ. It differs in the following regards:—

Head with the centre of the vertex dark grey, with the two brown spots less evident. Mesonotal præscutum with the stripes buffy, the intermediate pair divided by a very conspicuous dark brown median vitta that is much darker than the stripes themselves. Halteres longer. Femora yellow, with two dark brown rings, the outermost subterminal in position, leaving the apex conspicuously yellow, this almost as extensive as the subterminal pale ring; in *hardyi* the apex is broadly darkened, with only an incomplete pale spot; tibiæ yellow, with three black rings, the dark apex narrowest, less than one-fourth as extensive as the yellow subterminal ring; in *hardyi*, the dark apex is extensive, being approximately equal to the basal dark ring and about one-half as long as the yellow subterminal ring; tarsi pale yellowish brown, the terminal segments darkened. Wings with the ground-colour pale yellow, the dark spotted and dotted pattern not or scarcely confluent, and thus not extensively concealing the ground-colour; in *hardyi* the dark pattern is very extensive, appearing as confluent spots and dots that largely conceal and restrict the deeper yellow ground-colour. Costal fringe somewhat shorter and less conspicuous.

*Hab.* New South Wales, Victoria.

*Holotype*, ♂, Belgrave, Victoria, in fern-gully, January 13, 1929 (*F. E. Wilson*).

*Paratopotypes*, ♂, 1 damaged specimen of doubtful sex, February 6, 1928 (*F. E. Wilson*); ♂ ♀, January 26, 1930 (*F. E. Wilson*). *Paratype*, ♂, Rous, Richmond R., New South Wales, March 23, 1923 (*V. J. Richmond*).

I take great pleasure in naming this fly in honour of my friend Mr. F. Erasmus Wilson, who has built up one of the most important collections of Australian Tipulidæ. The smallest measurements pertain to the Richmond River male.

### *Bergrothomyia tregellasi*, sp. n.

General coloration brownish yellow, the præscutum with four dark brown stripes; antennæ and legs black; wings subhyaline, with a restricted brown pattern; $R_{2+3+4}$ shorter than $R_3$ alone.

*Male.*—Length, excluding rostrum, about 8 mm.; wing 8 mm.; rostrum about 1·2 mm.

*Female.*—Length, excluding rostrum, about 9·5 mm.; wing 8·6 mm; rostrum about 1·1 mm.

Rostrum and palpi black, the former exceeding in length the remainder of head. Antennæ black throughout, slightly longer than the rostrum; flagellar segments elongate, with verticils that slightly (♀) or considerably (♂) exceed the segments in length; terminal segment about two-thirds the penultimate. Head buffy grey, the central region of vertex dark brown; anterior vertex wide.

Pronotum brownish grey, darker medially. Mesonotal præscutum brownish yellow, with four conspicuous black stripes, the intermediate pair not reaching the suture; tuberculate pits and pseudosutural foveæ black, the præscutum being strongly constricted at the level of the latter; scutum heavily yellow pollinose, each lobe with two brown areas; scutellum and postnotum brown, heavily yellow pollinose, especially the latter. Pleura grey, vaguely variegated with darker. Halteres yellow, the base of the knobs a little darker. Legs with the coxæ and trochanters pale ochreous; legs black, the femoral bases paler. Wings subhyaline, with a sparse dark brown pattern; stigma large, oval; very narrow and restricted dark seams at origin of *Rs*, along cord and outer end of cell *1st* $M_2$, and as a marginal seam in the radial field; veins black. Venation: $Sc_1$ ending just before the fork of *Rs*, $Sc_2$ at its tip; $R_{2+3+4}$ shorter than $R_3$ alone; $R_2$ subequal to $R_{1+2}$, a little beyond the fork of $R_{2+3+4}$; cell *1st* $M_2$ large; *m–cu* more than two-thirds its length beyond the fork of *M*.

Abdominal tergites dark brown, the basal rings of the segments subglabrous and paler, producing more or less distinct bands; sternites brownish yellow. Ovipositor with the valves dark brown, very long and straight.

*Hab.* Victoria.

*Holotype*, ♀, Belgrave, March 3, 1929 (*T. Tregellas*).

*Allotype*, ♂, Mt. Donna Buang, above Warburton, altitude 3000–3800 feet, March 2, 1930 (*F. E. Wilson*).

*Paratype*, 1 ♀, with the allotype.

This interesting crane-fly is named in honour of the collector of the type-specimen, Mr. T. Tregellas. *Bergrothomyia tregellasi* is very distinct from the two allied forms by the nearly unmarked wings.

### *Limnophila recedens*, sp. n.

General coloration dark brown; antennæ (♂) elongate; halteres long, yellow, the knobs infuscated; wing with a strong brown tinge; numerous macrotrichia in cells of wing beyond cord; $Sc_1$ long; cell $R_3$ sessile or nearly so; cell $M_1$ present; male hypopygium with each gonapophysis terminating in a simple point.

*Male.*—Length about 7 mm.; wing 7·6 mm.; antenna about 3 mm.

Rostrum and palpi black. Antennæ black throughout, elongate (♂), as shown by the measurements; flagellar segments subcylindrical, with coarse erect setæ and scattered, slightly longer verticils; terminal segment small, oval, not exceeding one-third the length of the penultimate. Head dark brown, with a sparse yellowish pollen.

Mesonotum dark brown; tuberculate pits lacking; pseudosutural foveæ limited to a small marginal depression; posterior sclerites of mesonotum dark brown. Pleura dark brown, the region of the wing-root somewhat brighter. Halteres elongate, yellow, the knobs infuscated. Legs with the coxæ brown; trochanters yellow; remainder of legs black, the femoral bases restrictedly brightened. Wings with a strong brown suffusion, the oval stigma slightly darker brown; veins dark brown. Numerous macrotrichia in cells beyond the cord, lacking in the extreme bases of cells $R_3$, $R_4$, and $R_5$. Venation: $Sc_1$ ending shortly beyond the base of cell $R_3$, $Sc_2$ some distance from its tip, $Sc_1$ alone nearly twice *m–cu*; *Rs* long; cell $R_3$ sessile or nearly so, $R_{2+3+4}$ being very short to lacking; $R_2$ a trifle shorter than $R_{1+2}$; inner ends of cells $R_4$, $R_5$, and 1*st* $M_2$ in oblique alignment, the last most proximad; cell $M_1$ present, subequal to its petiole; cell 1*st* $M_2$ small; *m–cu* about one-half its length beyond the fork of *M*.

Abdomen brownish black, the hypopygium more brownish yellow. Male hypopygium with the median region of the tergite with a shallow rounded notch. Outer dististyle entirely blackened, a simple gently curved rod, its apex very shallowly and weakly bifid, the entire style clothed with abundant erect coarse setæ. Gonapophyses appearing as flattened plates, the apical point stout but simple. Ædeagus relatively short.

*Hab.* Victoria.

*Holotype*, ♂, Mt. Donna Buang, above Warburton, altitude 3800–4000 feet, in forest of southern beech and sassafras, December 14, 1930 (*F. E. Wilson*).

*Limnophila recedens* is allied to species such as *L. pilosipennis*, Alexander, differing conspicuously in the dark brown coloration, together with the venation, notably the long $Sc_1$ and the sessile or subsessile cell $R_3$.

### *Limnophila longicellula*, sp. n.

General coloration dark brown, pollinose; præscutal stripes very short, black; halteres obscure yellow; wings yellow, with a brown pattern; $R_{2+3+4}$ relatively long, about one-half *Rs*; cell 1*st* $M_2$ very long, exceeding any of the veins beyond it.

*Male*.—Length about 5·3 mm.; wing 6·2 mm.

Rostrum black, sparsely pollinose. Antennæ black throughout, short, if bent backward not extending far beyond the head. Head dark, with a heavy yellow pollen.

Pronotum dark brown, the posterior notum more yellowish laterally. Mesonotal præscutum dark, heavily yellow pollinose, the usual stripes black, very abbreviated, especially the intermediate pair, which appear as elongate-oval areas behind the tuberculate pits; pseudosutural foveæ and tuberculate pits black, the latter placed far behind the cephalic margin of the sclerite; remainder of mesonotum chiefly dark brown, the median region of scutum obscure yellow. Pleura dark-coloured, including the dorso-pleural membrane. Halteres obscure yellow. Legs with the coxæ and trochanters obscure yellow; remainder of legs broken. Wings yellow, with a relatively heavy brown pattern that is restricted to the vicinity of the veins, including areas at *h*, bases of cells *R* and *M*, origin of *Rs*, fork of *Sc*, stigma, cord, and outer end of cell 1*st* $M_2$; marginal seams at ends of veins $R_3$, $R_4$, and less conspicuously on the medial veins; axillary region darkened; veins pale, darker in the infuscated areas. Venation: $Sc_1$ ending shortly before the fork of *Rs*, $Sc_2$ near its tip; *Rs* long, angulated and short-spurred at origin; $R_{2+3+4}$ elongate, about one-half *Rs*; $R_2$ just beyond the fork of $R_{3+4}$; cells 1*st* $M_2$ unusually long, exceeding any of the veins beyond it, cell $M_1$ correspondingly small; basal section of $M_3$ long, subequal to the distal section; *m–cu* more than its own length beyond the fork of *M*.

Abdomen brownish black, including the hypopygium. Male hypopygium with the basistyles elongate, relatively slender. Outer dististyle a blackened, nearly straight rod, the outer apical angle produced into a blackened spine, the outer surface with abundant appressed spinulæ. Inner dististyle pale, broad-based, with a small setiferous axillary lobe. Interbasal lobe appearing as a flattened squamulose plate, the outer end broadly oval, the inner end more pointed. Gonapophyses produced into a long, slender, sinuous point. Ædeagus very short.

*Hab.* Victoria.

*Holotype*, a broken ♂, Belgrave, in dark fern-gully, March 31, 1929 (*F. E. Wilson*).

*Limnophila longicellula* is generally similar to *L. jucunda*, Alexander, differing especially in the venation and details of structure of the male hypopygium.

### *Limnophila angusticellula*, sp. n.

General coloration dark brown, the postnotum grey; legs yellow, the tips of the femora and tibiæ dark brown; wings pale brownish, with a restricted darker brown pattern; *Rs* weakly angulated at origin; $R_{2+3+4}$ relatively short, only about two-thirds to three-fourths $R_{2+3}$, the latter nearly three times $R_2$; cell 1*st* $M_2$ long and narrow, exceeding any of the veins beyond it.

*Female.*—Length about 7 mm.; wing 8·2 mm.

Rostrum and palpi black. Antennæ brownish black throughout, relatively short, if bent backward not attaining the wing-root; flagellar segments subcylindrical, the verticils exceeding the segments; terminal segment longer than the penultimate. Head yellowish grey, the anterior vertex brighter yellow.

Mesonotum chiefly dark brown, badly crushed in the unique type; scutellum paler; postnotum grey. Pleura brownish grey, the dorso-pleural region dark; pteropleurite a little paler. Halteres obscure yellow. Legs with the coxæ brownish yellow; trochanters obscure yellow; femora yellow, the tips rather narrowly but conspicuously dark brown; tibiæ yellow, the tips infuscated; tarsi yellow, the terminal segments infuscated; legs with conspicuous erect setæ. Wings pale brownish, with a restricted but conspicuous darker brown pattern, distributed as follows:—Post-arcular in cells *R* and *M*; origin of *Rs*, continued across cell *M* to vein *Cu*; along the cord and as a seam along $Cu_1$; outer end of cell 1*st* $M_2$ more narrowly darkened; stigma elongate, paler brown; $R_2$ narrowly seamed with darker; veins pale brown, darker in the infuscated areas. Venation: *Sc* relatively short, $Sc_1$ ending about opposite three-fourths *Rs*, $Sc_2$ a short distance from its tip; *Rs* long; weakly angulated at origin; $R_{2+3+4}$ about two-thirds to three-fourths $R_{2+3}$, the latter nearly three times $R_2$; $R_3$ a little longer than $R_{1+2}$; cell $R_3$ deep, the veins enclosing it gently sinuous; anterior cord in oblique alignment; cell 1*st* $M_2$ unusually long and narrow, exceeding any of the veins beyond it; *m* transverse, less than one-half as long as the arcuated basal section of $M_3$; cell $M_1$ shallow, about two-thirds longer than its petiole; *m–cu* more than its length beyond the fork of *M*. A weak spur on vein *M* at near mid-length, jutting distad into cell *M*, is possibly adventitious.

Abdomen brownish black, the genital segment obscure yellow. Ovipositor with the tergal valves very long and slender, yellowish horn-colour.

*Hab.* Victoria.

*Holotype*, ♀, Healesville, April 21, 1929 (*E. E. Wilson*).

Although generally similar to *L. longicellula*, sp. n., the present fly appears to represent an entirely distinct species, distinguished chiefly by the venation of the radial field.

### *Limnophila brunneistigma*, sp. n.

Belongs to the *jucunda* group; general coloration of mesonotum shiny castaneous, the postnotum and pleura black; antennal flagellum light yellow; legs yellow, conspicuously setiferous; wings pale yellow, the oval stigma dark brown; abdomen blackened, the caudal margins of the segments narrowly yellow.

*Male.*—Length about 4·2–4·4 mm.; wing 5·2–5·6 mm.

*Female.*—Length about 5·2 mm.; wing 6 mm.

Rostrum and palpi dark brown. Antennal scape dark brown, the flagellum conspicuously light yellow; antennæ (♂) relatively short, if bent backward not reaching the wing-root. Head black, sparsely pruinose.

Pronotum brownish black, the anterior lateral pretergites obscure yellow. Mesonotal præscutum shiny light castaneous, more blackened anteriorly; scutum castaneous; scutellum broad, infuscated, paler caudally; postnotum blackened. Pleura conspicuously blackened. Halteres yellow. Legs yellow, the outer tarsal segments infuscated; segments of legs with long, conspicuous, erect setæ. Wings pale yellow, the oval stigma conspicuous, dark brown; veins yellow. Venation: $Sc_1$ ending about opposite three-fourths the length of *Rs*, $Sc_2$ not far from its tip; $R_2$ longer than $R_{2+3}$, sometimes at fork of $R_{3+4}$, about one-half $R_{1+2}$; cell $M_1$ small; *m–cu* at near mid-length of cell *1st* $M_2$; wing widest just behind the termination of vein *2nd A*.

Abdomen blackened, the caudal margins of the segments narrowly and obscurely yellow; hypopygium chiefly brownish yellow. Male hypopygium with the outer dististyle a straight blackened rod, the apex truncated, the outer apical angle a powerful appressed spine, with a few tiny appressed teeth on its outer face. Ædeagus very short.

*Hab.* Victoria.

*Holotype*, ♂, Belgrave, in dark fern-gully, March 31, 1929 (*F. E. Wilson*).

*Allotopotype*, ♀.

*Paratopotypes*, 5 ♂♂.

*Limnophila brunneistigma* is allied to *L. suspecta*, Alexander, and related forms, differing from all in the peculiar pattern of the wings.

### *Limnophila kershawi*, Alexander.

The discovery of the race described herewith as *cumberlandensis* has made it necessary to review the present species. There now appear to be three distinct races or, perhaps, varieties, distinguished by the pattern of the wings, together with slight structural differences that appear to be constant. *L. k. dandenongensis*, subsp. n., has the wings nearly immaculate, *L. k. cumberlandensis*, subsp. n., has them heavily patterned, while typical *kershawi* occupies an intermediate position.

### *Limnophila kershawi dandenongensis*, subsp. n.

Differs from the typical form in the almost uniformly yellow wings, which are unmarked basad of the cord with the exception of a very small brown spot at origin of *Rs* and sometimes at tip of vein *2nd A*. In *kershawi* there is a postarcular dark pattern in cell *R*, while the markings of the distal portions of the wing are usually heavier. Male hypopygium with the interbasal structures relatively short and broad, not produced caudad into a long tapering point. Gonapophyses unusually broad and flattened, the outer margin and surface with abundant microscopic spinulæ.

*Hab.* Victoria.

*Holotype*, ♂. Sassafras, Dandenong Range, October 19–20, 1922 (*A. Tonnoir*); returned to Dr. Tonnoir, as a paratype of *kershawi*.

*Allotopotype*, ♀.

*Paratopotype*, ♂; *paratypes*, ♂, Millgrove, April 7, 1928 (*F. E. Wilson*); ♂ ♀, Mt. Donna Buang, above Warburton, altitude 3800–4000 feet, in forest of southern beech and sassafras, December 14, 1930 (*F. E. Wilson*).

### *Limnophila kershawi cumberlandensis*, subsp. n.

Generally similar to the typical form (Ann. & Mag. Nat. Hist. ser. 10, vol. i. pp. 219–220, 1928), differing in the more heavily-patterned wings and details of structure of the male hypopygium. Wings with the ground-colour more whitish than yellow, the costal and subcostal cells strongly infumated, their outer ends clearer; dark wing-pattern very heavy, including the usual darkened apices of cells $R_2$ and $R_3$; a conspicuous band along the cord; spots at base of cell *R*, origin of *Rs*, tip of *Sc*, outer end of cell 1*st* $M_2$, and as extensive marginal clouds on the medial, cubital, and anal veins; a conspicuous dark seam on *Rs* beyond mid-length of the vein; axilla darkened. Male hypopygium with the interbasal processes appearing as long, nearly straight blades that are broadest at base, thence slightly narrowed, the apex obtuse. Gonapophyses narrower than in *dandenongensis.*

*Hab.* Victoria.

*Holotype*, ♂, Cumberland Valley, near Marysville, November 10, 1928 (*F. E. Wilson*).

*Paratypes*, several of both sexes, Walhalla, April 18–22, 1930 (*F. E. Wilson*).

### *Limnophila brachyptera*, sp. n.

Nearly apterous, at least in the female sex; antennæ 15-segmented, the terminal segment long; legs long, the segments with conspicuous setæ; halteres pale, the knobs very weakly developed; wings about as long as the halteres.

*Female.*—Length about 11 mm.; wing about 1 mm.

Rostrum greyish brown, the palpi dark brown. Antennæ 15-segmented, the basal segment dark brown, sparsely pruinose, the second scapal and basal portion of first flagellar segment yellow; remainder of antennæ dark brown; flagellar segments oval, gradually decreasing in size outwardly, the terminal segment equal in length to the preceding two segments combined, and evidently the result of fusion. Head brownish grey.

Thorax relatively small, the postnotal mediotergite shortened; notum brownish yellow, the præscutum darker medially in front; pseudosutural foveæ black, large and conspicuous, sinuous in shape; no tuberculate pits. Pleura yellowish grey, the dorso-pleural region clearer yellow. Legs long and relatively stout, the segments with conspicuous outspreading setæ; coxæ yellowish grey; trochanters yellow; femora, tibiæ, and basitarsi yellow, the tips weakly darkened; remainder of tarsi dark brown. Halteres pale, slender, about as long as the wing, the knobs scarcely developed. Wings generally pale, greatly reduced in size, as shown by the measurements; basal portion of wing narrowed, the distal two-thirds dilated into a broad blade; costal margin with long conspicuous trichia on distal half, these greatly reduced in number on proximal half; one powerful radial vein provided with numerous trichia on a little less than the outer half; a few other trichia on veins behind the radial field.

Abdomen relatively long and slender; tergites dark brown, the sternites more yellowish. Ovipositor with the valves long and slender, yellowish horn-colour.

*Hab.* New South Wales.

*Holotype*, ♀, Club Lake, Mt. Kosciusko, altitude 6000 feet, January 28, 1930 (*R. J. Tillyard*).

*Limnophila brachyptera* cannot be associated with any species so far described. It is very different from *L. subapterogyne*, Alexander, the only other *Limnophila* known from Australia in which the wings of the female are greatly reduced.

### *Limnophila acuspinosa*, sp. n.

General coloration grey; mesonotal præscutum with a darker median stripe; antennæ short in both sexes; halteres yellow; legs chiefly black; wings relatively long and narrow, pale yellow, the stigmal area a trifle darker; $R_{2+3+4}$ long, in alignment with *Rs*, about one-half as long as the straight anterior branch of *Rs*; $R_2$ near the fork of $R_{3+4}$; cell $M_1$ present; abdomen black, the hypopygium abruptly fulvous-yellow; male hypopygium with the tip of the outer dististyle a long simple black spine.

*Male.*—Length about 5·5 mm.; wing 6·4–6·5 mm.

*Female.*—Length 6–7 mm.; wing 6–7·8 mm.

Rostrum brownish black; palpi short, black. Antennæ short in both sexes, black throughout; flagellar segments oval, becoming smaller and somewhat shorter outwardly, the terminal segment larger than the penultimate; verticils delicate, longer than the segments. Head grey.

Mesonotal præscutum light reddish brown, sparsely pruinose, darker brown medially in front, the lateral stripes little or scarcely apparent; no tuberculate pits; pseudosutural foveæ relatively small, lying not far from the lateral margin; scutum brown, sparsely pruinose; scutellum light grey, margined posteriorly with paler; postnotal mediotergite small, obscure yellow. Pleura with the propleura, anepisternum, and sternopleurite conspicuously grey, the posterior pleurites more testaceous-brown. Halteres pale yellow. Legs with the fore coxæ brown, sparsely pruinose, the remaining coxæ pale; trochanters brownish yellow; femora brownish yellow, passing into black; remainder of legs black; legs relatively long and slender, with conspicuous subappressed setæ; tibial spurs setiferous, except at tips. Wings relatively long and narrow, pale yellow, the stigmal area a little darker; veins brownish yellow. Macrotrichia of veins relatively sparse, mostly beyond the level of the cord. Venation: $Sc_1$ ending just before the level of the anterior end of *r-m*, $Sc_2$ at its tip; *Rs* in alignment with $R_{2+3+4}$, this vein about one-half the nearly straight anterior branch of *Rs*; $R_2$ shortly beyond the fork of $R_{3+4}$ and about two-fifths the length of $R_{1+2}$; inner ends of cells $R_4$, $R_5$, and 1*st* $M_2$ in subtransverse to oblique alignment, in the latter case cell 1*st* $M_2$ most basad; *r–m* arcuated; cell $M_1$ present, shorter than its petiole; *m–cu* about one-half to one-third its length beyond the fork of *M*.

Abdominal tergites black, the hypopygium conspicuously fulvous-yellow; sternites more pruinose, the basal segments more yellowish. Male hypopygium with the outer dististyle pale, terminating in an unusually long, slender, blackened point, gradually narrowed to the slightly curved acute tip; style provided with numerous long setæ. Gonapophyses appearing as flattened pale blades, the tips bifid and microscopically toothed. Ædeagus relatively elongate, more or less spiraloid within the sheath. Ovipositor with the genital segment obscure fulvous, the tergal valves long and nearly straight.

*Hab.* New South Wales.

*Holotype*, ♂, Wentworth Falls, Blue Mts., October 20–30, 1930 (*F. E. Wilson*).

*Allotopotype*, ♀.

*Paratopotypes*, 3 ♂ ♀.

*Limnophila acuspinosa* is readily told from allied species of the genus in the Australian fauna by the diagnostic features listed, especially the structure of the male hypopygium.

### *Ischnothrix* (*Ischnothrix*) *grampiana*, sp. n.

General coloration grey, variegated with black; antennal flagellum black, the basal segment (♀) subequal to the succeeding two combined; præscutum with broad brownish black on anterior half, this divided behind to enclose an elongate-oval grey area that reaches the suture; wings whitish, with a heavy dark brown pattern that consists of solid areas in most cells; vein $R_3$ oblique.

*Female.*—Length about 8–8·5 mm.; wieg 7·5–8 mm.

Rostrum black, with a yellowish-grey pollen; palpi black. Antennæ black, the scapal segments dark brown; first flagellar segment ( ♀ ) elongate, subequal to or exceeding the following two taken together; remaining flagellar segments gradually decreasing in length outwardly, the distal segments crowded, the terminal segments more or less fused; verticils relatively short and inconspicuous, on the intermediate segments shorter than the segments alone. Head dark brown, with a heavy yellowish-grey pollen, the centre of the vertex with a small brown spot.

Mesonotal præscutum with a greyish ground-colour, variegated with brownish black; a very broad median dark stripe that divides at near mid-length, the arms enclosing an elongate-oval grey area; humeral region narrowly lined with black; an interrupted brownish-black sublateral line; scutum grey, each lobe with brownish-black areas; posterior sclerites of mesonotum grey, the scutellum with a black spot on either side of median line at base. Pleura grey, the dorsal sclerites more yellowish grey, with two narrow dark brown longitudinal stripes, the more dorsal shorter, occupying the area between the anepisternum and sternopleurite, the longer ventral stripe crossing the sternopleurite on to the pteropleurite. Halteres pale yellow, the knobs conspicuously whitish, their basal portions a little dusky. Legs with the coxæ grey, the base of the fore coxæ dark brown; trochanters obscure yellow; femora yellow basally, the distal half passing into black, the extreme tip narrowly pale yellow; a narrow subterminal yellow ring, the broad subterminal annulus enclosed between these pale areas more intensely black; tibiæ obscure yellow, the bases and tips rather narrowly blackened; tarsi black, the proximal ends of basitarsi slightly paler. Wings whitish to pale grey, with an unusually conspicuous dark brown pattern that appears as broken, relatively small, solid brown spots arranged as in other related species, not pale grey as in *australasiæ*, and more broken into isolated areas than in *lawsonensis*; costal cell almost unvariegated, except at base and apex; marginal spots and seams at ends of all longitudinal veins; veins black, the prearcular region and cell $Cu_1$ pale yellow. Venation: *Rs* long, more than one-half longer than the petiole of cell $R_3$; vein $R_3$ slightly oblique, the distance on costa between $R_{1+2}$ and $R_3$ about three-fourths the latter vein; *m–cu* at fork of *M*.

Abdomen black, the extreme caudal margins of the tergites pale; genital shield of ovipositor blackened basally; the remainder dark castaneous; valves long and slender, dark brown, the tips pale.

*Hab.* Victoria.

*Holotype,* ♀, Grampians, Silver Band Falls, in fern-gully, October 1928 (*F. E. Wilson*).

*Paratype,* ♀, Grampians, not in fern-gully, October 1928 (*F. E. Wilson*).

*Ischnothrix grampiana*, although allied to *I. australasiæ* (Skuse), appears to be very distinct in the pattern of the body and wings.

### *Ischnothrix* (*Ischnothrix*) *mathewsi*, sp. n.

*Male.*—Length about 5·2 mm.; wing 6 mm.; antenna about 5·6 mm.

Generally similar to *I.* (*I.*) *australasiæ* (Skuse) in general appearance, differing especially in the very simple structure of the male hypopygium.

Antennæ (♂) distinctly longer than the body, as shown by the measurements; first scapal segment brown, the succeeding four segments yellowish testaceous, the remainder passing into dark brown, the sutures very restrictedly pale; flagellar segments elongate-cylindrical, decreasing in length outwardly, clothed with conspicuous erect pale setæ. Head discoloured. Mesonotum grey, variegated with brown, the pattern largely discoloured and obliterated. Pleura extensively pruinose. Halteres pale, the apices of the knobs infuscated. Legs with the coxæ darkened basally, the tips pale; trochanters pale; femora obscure yellow, with a very broad black subterminal ring; tibiæ obscure yellow, both ends narrowly darkened; tarsi obscure yellow, passing into dark brown. Wings whitish subhyaline, with a sparse brown pattern arranged about as in *australasiæ*, but more ocelliform, especially in the medial, cubital, and anal fields; a continuous subterminal dark line in cells $R_5$ to $M_4$, paralleling the outer margin of the wing. Venation: $Sc_2$ at tip of $Sc_1$; $R_3$ very short, nearly erect; distance on costa between tips of $R_{1+2}$ and $R_3$ subequal to the latter vein; $R_4$ at apex curved slightly cephalad, cell $R_3$ being relatively small; basal section of $M_3$ relatively short, subequal to $M_4$, *m–cu* just before the fork of *M*.

Abdominal segments obscure brownish yellow, the lateral margins darkened; subterminal segments black; hypopygium yellow. Male hypopygium with the phallosome very simple in structure, the broad liguliform ædeagus subtended on either side by a flattened plate that narrows into a rod terminating in two acute decussate spines.

*Hab.* West Australia.

*Holotype*, ♂, Perth, May 4, 1927 (*W. H. Mathews*).

This interesting *Ischnothrix* is named in honour of the collector of the type-specimen.

### *Gynoplistia* (*Xenolimnophila*) *flindersi*, sp. n.

General coloration brownish grey, the præscutum with four dark brown stripes; antennæ (♂) 16-segmented, the basal flagellar segments very weakly serrulate; wings whitish subhyaline, with restricted brown pattern.

*Male.*—Length about 19 mm.; wing 16·5–17 mm.

Rostrum reddish brown; palpi dark brown, short. Antennæ apparently only 16-segmented; basal segments reddish yellow, the flagellum brownish black; basal four or five flagellar segments very weakly and insensibly serrate at outer end, this condition barely indicated; outer segments subcylindrical, with long verticils; terminal segment very long, subequal to the preceding two taken together. Head reddish brown, with a sparse grey bloom.

Pronotum grey. Mesonotal præscutum brownish grey, with four dark brown stripes that are narrowly margined with grey, the intermediate pair becoming obsolete some distance before the suture; lateral stripes crossing the suture and suffusing the scutal lobes; scutellum more reddish brown; postnotum reddish brown, more pruinose in front, with a faintly darker median vitta. Pleura reddish, with a heavy grey pruinosity, the ventral sternopleurite darker; dorso-pleural region dusky. Halteres elongate, yellow, the knobs dark brown. Legs with the coxæ reddish, grey-pruinose; trochanters castaneous-brown; femora reddish brown, the tips very slightly darker; tibiæ reddish brown, the outer half passing into brownish black; tarsi black. Wings relatively narrow, whitish subhyaline, with a restricted brown pattern; prearcular region and cell *C* yellowish; cell *Sc* somewhat darker; restricted brown areas at origin of *Rs* and on anterior cord; still narrower dark seams on posterior cord, outer end of cell 1*st* $M_2$, along the longitudinal veins beyond cord, and as a broader seam along *Cu*; stigma pale brown; veins dark brown. Venation: $R_{2+3+4}$ straight, subequal to the deflection of $R_5$; upper branch of *Rs* strongly sinuous, cell $R_3$ deep; cell $M_1$ about one-half longer than its petiole; *m–cu* at mid-length of cell 1*st* $M_2$; vein *2nd A* only gently sinuate.

Abdomen relatively elongate; tergites reddish brown, very sparsely pruinose; basal sternites reddish brown, the outer segments passing into darker brown; hypopygium reddish brown.

*Hab.* Tasmania.

*Holotype*, ♂, Flinders Island (*Miss Wood*).

*Paratopotype*, ♂.

*Gynoplistia flindersi* is very distinct from the two previously described species of the subgenus *Xenolimnophila*, differing from *G.* (*X.*) *fergusoni* (Alexander) by the very different wing-pattern and from *G.* (*X.*) *zaluscodes* (Alexander) by the fully-winged condition of the male sex.

### *Gynoplistia* (*Paralimnophila*) *signifera*, sp. n.

General coloration grey, the præscutum with three narrow brownish-black stripes; scutal lobes each with two clearly defined brownish-black areas; pleura with a conspicuous brownish-black longitudinal stripe; legs black, the genua narrowly whitened; tarsi chiefly yellowish white; wings whitish, with a heavy brown pattern; *m–cu* more than one-half its length beyond the fork of *M.*

*Female.*—Length about 18 mm.; wing 16 mm.

Rostrum short, grey; palpi black. Antennæ broken beyond the ninth segment; basal segment dark brown, the remaining segments light reddish brown; all flagellar segments (1 to 7) with a conspicuous apical tooth, these becoming smaller on the outer segments and presumably becoming obsolete by flagellar segment 9 or 10. Head light grey, with a capillary brown median line.

Mesonotal præscutum light grey, with three narrow but conspicuous brownish-black stripes, the median stripe narrowed on the posterior side, the lateral stripes narrow; posterior interspaces and sublateral portions of sclerite with a weak brown suffusion; pseudosutural foveæ large, reddish brown; scutal lobes grey, each with two brownish-black areas, the posterior one largest; scutellum reddish brown, pruinose; postnotal mediotergite grey, with a median linear black line in front, ending in a point at near two-thirds the length of the sclerite; cephalic lateral portions of sclerite darkened; caudal margin of sclerite with a circular clouded area on either side of median line. Pleura grey, with a broad conspicuous black longitudinal stripe extending from the cervical region to the pleurotergite. Halteres yellow, the knobs blackened. Legs with the femora black, the bases narrowly obscure yellow; genua narrowly but conspicuously pale, dusted with white, the amount of the area subequal on both femora and tibiæ; remainder of tibiæ black; basitarsi with the proximal half darkened, the distal half and segments 2 and 3 yellowish white; terminal tarsal segments brown. Wings whitish, with a heavy brown pattern, including cells *C* and *Sc*; stigma oval, brownish black; conspicuous dark brown areas at origin of *Rs*, at near one-fourth the length of cell *R*, along the cord, and as conspicuous seams at forks of veins $R_3$, $M_{1+2}$, and the veins beyond the cord; distal third of vein *M*, outer end of cell 1*st* $M_2$, and washes in ends of the anal cells somewhat paler brown; veins dark brown to black. Venation: fork of $R_{2+3+4}$ about opposite *r–m*; *m–cu* more than one-half its length beyond the fork of *M*.

Abdomen dark grey, the segments narrowly pale on lateral margins; basal sternites paler, the outer segments more infuscated.

*Hab.* Victoria.

*Holotype*, ♀, mountains above Warburton, March 1930 (*F. E. Wilson*).

*Gynoplistia* (*Paralimnophila*) *signifera* is most similar to *G.* (*P.*) *præsignis*, Alexander, in the general coloration of the mesonotal præscutum, with three clearly defined brownish-black stripes on a grey ground, differing conspicuously in the pattern of the legs. In the latter character the present fly is most similar to *G.* (*P.*) *styligera*, Alexander, which has a very different præscutal pattern.

### *Gynoplistia* (*Paralimnophila*) *eucrypta*, sp. n.

Size small (wing, ♂, under 7·5 mm.); all tarsi cream-coloured; wings narrow, greyish, the oval stigma dark brown; *m–cu* at fork of *M*; male hypopygium with the inner dististyle unequally bilobed at apex; gonapophyses at apex produced into a long sinuous spine, the mesal angle at base of spine evenly rounded.

*Male.*—Length about 8 mm.; wing 7·2 mm.; antenna about 4·3 mm.

Rostrum pruinose; palpi black. Antennæ black throughout, 16-segmented, the formula being 2 + 13 + 1; last branch shorter than the terminal segment; setæ of flagellar segments relatively long and conspicuous. Head brown, the orbits broadly grey.

Mesonotal præscutum grey, with three brown stripes, the interspaces suffused with brown; pseudosutural foveæ black, conspicuous; scutal lobes brown; remainder of mesonotum grey. Pleura clear light grey. Halteres pale, the knobs infuscated. Legs with the coxæ yellow, a trifle infuscated on outer face; femora black, the bases obscure yellow; tibiæ black; tarsi cream-coloured, the proximal two-thirds or more of basitarsi black; last tarsal segments darkened.

Wings narrow, greyish, the stigma oval, dark brown; barely evident dark clouds at origin of *Rs*, along cord, and outer end of cell 1*st* $M_2$; veins dark. Venation: $R_{2+3+4}$ longer than $R_{2+3}$: *m–cu* at fork of *M*.

Abdominal tergites dark brown, sparsely pruinose; sternites and hypopygium somewhat paler brown. Male hypopygium with the outer dististyle expanded at apex into a conspicuous blade, the outer apical angle further produced into an acute black spine. Inner dististyle with the apex unequally bilobed at apex, there being a small blunt tubercle before the wider apex. Phallosome somewhat as in *miseranda*, the gonapophyses being narrowed into long, sinuous, tail-like points; mesal-apical angles of gonapophyses evenly rounded, not produced into acute spikes as in *miseranda*. Superimposed over the gonapophyses is a flattened plate set with abundant short spines to produce a mace-like effect, somewhat as in *puella*, but with the teeth smaller and less distinct; mesal portions of these plates further elevated into larger and more conspicuous spines.

*Hab.* New South Wales.

*Holotype*, ♂, Blundell's, F.C.T., altitude 3000 feet, January 7, 1930 (*A. Tonnoir*).

Among the small species of the subgenus *Gynoplistia* (*Paralimnophila*) *miseranda*, Alexander, is the closest ally of the present species, the two differing most evidently in the nature of the phallosomic structures of the male hypopygia.

### *Gynoplistia* (*Gynoplistia*) *tenuifilosa*, sp. n.

General coloration polished black, the thoracic pleura and coxæ heavily pruinose; antennæ (♂) 17-segmented, with thirteen branched segments, these branches unusually long and slender; knobs of halteres blackened; legs with the femora black, yellow basally; all tibiæ black; tarsi black, the basitarsi a little brightened basally; wings whitish, with a heavy cross-banded dark brown pattern; cells *C* and *Sc* dark brown; cell $M_1$ present; abdomen violaceous-black; male hypopygium with two elongate dististyles, the outer one slender, at apex microscopically spinose.

*Male.*—Length about 7 mm.; wing 6·8 mm.

Rostrum grey; palpi black. Antennæ (♂) long and slender, if bent backward extending nearly to the third abdominal segment, black throughout; 17-segmented, the formula being 2+2+11+2; branches unusually long and slender, the longest (about flagellar segments 6 or 7) a little less than one-half the entire flagellum; branch of first segment unusually elongate, more than three-fourths as long as the longest branch; last branch a trifle longer than the segment alone; terminal segment a little longer than the penultimate. Head grey, the anterior vertex wide.

Mesonotum polished black, smooth. Pleura, including all coxæ, black, heavily dusted with grey. Halteres brown, the knobs blackened. Legs with the coxæ pruinose, as described; trochanters obscure yellow; femora black, the bases of the segments restrictedly obscure yellow; all tibiæ black; tarsi black, the proximal third to half of the basitarsi, especially of the hind legs, more yellowish; remainder of tarsi black. Wings whitish, the prearcular region a trifle more yellowish; a heavy dark brown pattern, arranged as follows: cells *C* and *Sc*; a large area at one-third the length of cell *R*, confluent with a much larger area occupying the central half of cell *M*, the latter merging into areas in cell *Cu*, and a small cloud near the outer end of cell 1*st A*; a broad, nearly parallel-sided band from the stigma to posterior margin of wing, interrupted by a white central spot in cell 1*st* $M_2$; wing-tip darkened, more intensively in cell $R_3$; a darker oval cloud at fork of $M_{1+2}$; margin of apical third of cell 1*st A* clouded; veins brownish yellow, darker in the clouded areas. Venation: cell $R_3$ sessile, vein $R_{2+3}$ leaving *Rs* exactly at its fork; *m–cu* at or shortly beyond mid-length of cell 1*st* $M_2$.

Abdomen violaceous-black; hypopygium black. Male hypopygium without conspicuously developed apical lobes on basistyle. Two dististyles, the outer a little dilated at base, the apical half blackened and terminating in a group of from eight to ten spines. Inner dististyle approximately as long, appearing as a sinuous darkened rod. Two conspicuous black rods on either side of the ædeagus are interpreted as being gonapophyses, the innermost being a simple rod terminating in an acute spine, the lateral structure a flattened blade that terminates in two spinous points. Ædeagus simple.

*Hab.* New South Wales.

*Holotype*, ♂, Wentworth Falls, Blue Mts., October 20–30, 1930 (*F. E. Wilson*).

*Gynoplistia* (*Gynoplistia*) *tenuifilosa* is very different from all described Australian species of this remarkable genus.

### *Gynoplistia* (*Gynoplistia*) *forceps*, sp. n.

General coloration polished black, without distinct striolation; antennæ 16-segmented, with ten branched segments; thoracic pleura black, without pubescence; wings with a heavy brown pattern; cells *C* and *Sc* entirely darkened; abdomen, including hypopygium, black; male hypopygium with two dististyles, the outer profoundly bifid to form a forceps-like structure.

*Male.*—Length about 6·5 mm.; wing 6·5 mm.

Rostrum and palpi black. Antennæ 16-segmented, the formula being 2+2+8+4; black throughout; first branch about two and one-half times the segment; longest branch (flagellar segment 4 or 5) about one-half the flagellum; branch of tenth flagellar segment scarcely one-third the segment; terminal segment subequal to the penultimate. Head polished blue-black.

Mesonotum polished black, without conspicuous striolæ, the surface with scarcely indicated purplish reflections in certain lights. Pleura black, polished, without the usual appressed pubescence of the genus. Halteres brownish yellow, the knobs dark brown. Legs with the coxæ blackened; trochanters obscure yellow; femora yellow, the tips broadly blackened, the amount subequal on all legs; tibiæ black at both ends, more narrowly so at base, the intermediate portion of all tibiæ, including approximately one-half the segment, yellow; tarsi black. Wings whitish, the prearcular region yellow; a heavy dark brown pattern, including cells *C* and *Sc*; conspicuous areas at arculus, origin of *Rs*, along cord, and the wing-tip, the two latter confluent along the darkened caudal margin; a dusky wash in cells *M* and *Cu* adjoining vein *Cu*; veins brown, darker in the infuscated areas. Venation: *Rs* angulated at origin; veins $R_3$ and $R_4$ rather strongly divergent; cell $M_1$ present, a little longer than its petiole; cell *1st* $M_2$ small, with *m–cu* at near mid-length.

Abdomen, including the hypopygium, black. Male hypopygium with the outer dististyle a powerfully constructed forceps, the base broad and stout, the outer arm of the forceps a strongly curved black spine, the inner arm slightly less curved, its apex prolonged into a chitinized spike. Inner dististyle shorter ,appearing as a flattened blade, the apex a little dilated, truncated, the surface with microscopic punctures. Gonapophyses appearing as flattened, elongate, paddle-like blades, their tips whitened, obtuse. Ædeagus short, simple, the apex weakly notched.

*Hab.* New South Wales.

*Holotype*, ♂, Wentworth Falls, Blue Mts., October 20–30, 1930 (*F. E. Wilson*).

I cannot indicate any very close relative of this fly unless it is *Gynoplistia* (*Gynoplistia*) *histrionica*, Alexander, which has a similar glabrous thoracic pleuron, but is otherwise a very different fly.

*Gynoplistia* (*Gynoplistia*) *claripennis bifasciata*, subsp. n.

*Male.*—Length about 9 mm.; wing 8 mm.

Characters as in typical *claripennis*, Alexander, differing most evidently in the wing-pattern.

Antennæ 17-segmented, the formula being 2+2+10+3; black throughout; longest branch about one-third the organ, somewhat shorter than in the typical form. Head black, transversely striate. Mesonotum polished black, with vague greenish reflexions, the præscutum smooth or nearly so. Pleura heavily pruinose. Halteres pale, the knobs weakly infuscated. Legs as in the typical form, the pale ring of the posterior tibiæ occupying a little more than one-fourth the length of the segment. Wings hyaline; a band along cord and the narrow apex dark brown; a small dark spot at origin of *Rs*. Abdomen greenish black, including the hypopygium. Male hypopygium having the general structure of the species.

*Hab.* New South Wales.

*Holotype*, ♂, Condor Creek, Canberra, F.C.T., November 15, 1929 (*G. F. Hill*).

### *Gynoplistia* (*Gynoplistia*) *pallidicosta*, sp. n.

Belongs to the *melanopyga* group; antennæ (♂) 19-segmented, with 12 or 13 branched segments; of ♀ with 17 or 18 segments; thorax black; femora orange, the tips blackened, most extensively so on the posterior legs; wings whitish cream-coloured, this including the costal cell; prearcular cells orange; most veins seamed with dark; abdomen (♂) orange; hypopygium with dististyle bidentate at apex.

*Male.*—Length about 14 mm.; wing 10·5–11 mm.

*Female.*—Length about 16–17 mm.; wing 12·5 mm.

*Male.*—Rostrum black, with conspicuous yellow setæ; palpi black. Antennæ 19-segmented, the formula being 2+2+10+5 or 2+2+11+4; black throughout; longest branch about one-third the organ. Head black, the anterior vertex with a median carina.

Pronotum black, with a golden-yellow pollen on sides. Mesonotum black, the præscutal stripes polished, smooth, the interspaces with conspicuous yellow setæ. Pleura dull black, with a dense grey pruinosity covering most of the surface; ventral sternopleurite highly polished. Halteres light brown, the knobs brownish black. Legs with the coxæ and trochanters black, the former heavily pruinose; femora orange, the tips broadly blackened, narrowest on the fore legs where it includes about the distal third; on middle legs including about one-half; on the posterior legs only the basal sixth or seventh brightened; tibiæ light brown, the bases narrowly, the tips more broadly blackened; tarsi black. Wings whitish cream-coloured, the prearcular region orange; cell *C* pale, cell *Sc* infuscated; a dark pattern includes the extreme bases of cells *R* and *M*; a spot at origin of *Rs*; and a larger area that includes the stigma and anterior cord; most of the veins distad of the cord, as well as the principal veins from *M* caudad, clouded with paler brown; veins dark brown, orange in the prearcular region. Venation: $R_{2+3+4}$ very short; *m–cu* at from two-fifths to mid-length of cell 1*st* $M_2$.

Abdomen with the first segment black, the remainder orange, the outer segments a trifle more obscured; hypopygium orange. Male hypopygium with the dististyle conspicuously bispinous at apex, the outer spine slender, glabrous, the lower spine blunt at apex, its surface with short setæ. Ædeagus bifid, as in the group. Gonapophyses elongate, slender basally, the outer half expanded into a narrow blade, the apex further produced into a long angular black spine.

*Female.*—Characters almost as in male. Antennæ 17- or 18-segmented, the formula being 2+2+8+5 or 2+2+8+6; longest branch between three and four times as long as the segment. Abdominal tergites polished black, the incisures more yellow, especially well-defined on the caudal margins of the segments, the bright colour of the bases indicated only on the proximal segments; basal sternites more extensively orange; ovipositor orange.

*Hab.* New South Wales.

*Holotype*, ♂, Kiandra, January 26, 1930 (*R. J. Tillyard*).

*Allotopotype*, ♀, *in copula* with the type.

*Paratopotypes*, 1 ♂, 1 ♂; *paratypes*, 3 ♂ ♀, Tumbarumba, January 14, 1930 (*R. J. Tillyard*).

*Gynoplistia* (*Gynoplistia*) *pallidicosta* is most nearly allied to *G.* (*G.*) *melanopyga*, Schiner, and *G.* (*G.*) *westwoodi*, Skuse, differing in the coloration of the abdomen, the wing-pattern, and the details of structure of the male hypopygium.

### *Eriocera* (*Eriocera*) *setifera*, sp. n.

General coloration grey, the præscutum with four blackish stripes; thoracic interspaces with long erect setæ; anterior vertex produced into two small hairy tubercles; wings with a blackish tinge; $Sc_1$ ending opposite the fork of $Rs$; cell *1st* $M_2$ tending to be open by the atrophy of the basal section of $M_3$; *m–cu* before the fork of $M$, shorter than the distal section of $Cu_1$; ovipositor with the cerci relatively short, pale.

*Female.*—Length about 9·5 mm.; wing 11 mm.

Rostrum and palpi reduced, black. Antennæ with the scape black; flagellum broken. Head grey; anterior vertical region produced into a small black hairy tubercle on either side of the median line.

Mesonotal præscutum grey, with four blackish stripes, the intermediate pair confluent anteriorly, narrowly separated behind; extreme cephalic portion of præscutum with a weak median carina; præscutal interspaces with numerous long erect black setæ; humeral region of præscutum with a depressed blackened area; posterior sclerites of mesonotum grey, with conspicuous erect black setæ. Pleura blackish, grey-pruinose; dorsal anepisternum, dorsal sternopleurite, and postnotal pleurotergite with conspicuous black setæ. Halteres obscure brownish yellow. Legs with the coxæ grey, with conspicuous setæ; trochanters black; femora brownish black, the bases more yellowish, the apices more blackened; tibiæ and tarsi passing into black. Wings with a blackish tinge, the veins darker. Macrotrichia of veins relatively small and inconspicuous. Venation: $Sc_1$ ending opposite the fork of $Rs$; $R_2$ on $R_3$ just beyond the fork; $R_{1+2}$ relatively long, approximately one-half $R_{2+3}$; tip of vein $R_3$ atrophied; medial field tending to be evanescent, cell *1st* $M_2$ being open by the atrophy of the basal section of $M_3$, this character probably variable; *m–cu* before the fork of $M$, shorter than the distal section of $Cu_1$.

Abdomen black, pruinose; pleural membrane ochreous. Ovipositor with the tergal valves (cerci) relatively short, pale, approaching the fleshy type found in certain species.

*Hab.* New South Wales.

*Holotype*, ♀, Uriarra, near Canberra, F.C.T., altitude 2839 feet, January 11, 1929 (*T. G. Campbell*).

*Eriocera setifera* is very different from the other described Australian species of the genus, especially in the conspicuously hairy thorax. It is evidently more closely allied to *E. metallica* (Schiner) than to the North Queensland *E. aperta*, Alexander, and *E. australiensis*, Alexander. *Eriocera metallica* is readily told by the smooth thorax, metallic coloration of the body, pattern and venation of the wings, and the elongate valves of the ovipositor.

## XIX.—*The Identity of* Campsomeris aureola, *Saussure (nec Klug), and of* curvivittata, *Cameron (Hymenoptera,* Scoliidæ). By J. Chester Bradley, Cornell University, Ithaca, New York.

In 1911 Mr. R. E. Turner (Ann. & Mag. Nat. Hist. ser. 8, vol. viii., November 1911, p. 622), in speaking of *Campsomeris aureola*, Klug, said "It appears to belong to the desert fauna, and is in the British Museum from Mogador, Harkeko, and Karachi. By almost all authors a mistake has been made in confusing it with a common Ethiopian species in which the mesonotum is highly polished and almost without punctures and the wings strongly infuscated along the costal margin. I consider that the descriptions of Klug and Lepeletier both apply to the North African form, and cannot find that the Ethiopian species, which is distinct from *felina*, Sauss., has received a name. Saussure's description applies to the Ethiopian species, as also does Tullgren's." In 1917 (*loc. cit.* ser. 8, vol. xx., November 1917, p. 356) he indicated that *curvivittata*, Cameron, was the Ethiopian form previously referred to, and which had been misidentified by Saussure and Sichel as *aureola*, Klug. Since the date of the publication of the 'Catalogus specierum generis *Scolia*' by Saussure and Sichel the Ethiopian species has almost invariably been referred to as *aureola*. The name *curvivittata* has not come into usage.

*Dielis curvivittata* was described by Cameron in his report of the Kilimanjaro-Meru Expedition in 1910 (pt. 87, p. 229). Although there is no statement by Cameron as to the location of the type, the fact that the material belonged to the Stockholm Museum would indicate that the holotype should be in that museum. As a matter of fact, Cameron did not select a holotype, but marked all his specimens types. There is a specimen in the British Museum from the Cameron collection marked "type" on Cameron's manuscript pin-label, as well as by a British Museum printed label. There is also a specimen in the Stockholm Museum which is labelled "Mombo Sjöstedt Usambara," and bears the Cameron manuscript label "*Dielis curvivittata*, Cameron, type." In Cameron's original description only two specimens are referred to, and it is therefore clear that the two specimens mentioned are the entire material upon which the species was based. The specimen in the British Museum does not agree in all respects with the coloration of the abdomen as indicated by Cameron.

From the above considerations I hereby select and designate as lectotype the specimen in the Stockholm Museum, and I have so marked it on a red label which I have placed on the pin of the specimen.

Unfortunately, the lectotype in the Stockholm Museum and the paratype in the British Museum are of different species. The paratype in the British Museum is what Turner referred to in the quotation above, and to which he very naturally therefore in 1917 assigned the name *curvivittata*. It is *aureola* in the sense of Saussure and Sichel, not of Klug. In view of the fact that is is not *curvivittata* of Cameron the species is again without a name, and I therefore name it and describe it below.

The lectotype of *curvivittata*, Cameron, in the Stockholm Museum is identical with the type of *felina*, Saussure, which is also in the Stockholm Museum, and with which I have carefully compared it.

### *Campsomeris aureoloides*, sp. n.

1864. *Elis* (*Dielis*) *aureola*, Saussure & Sichel, Catalogue of the Species of the Genus *Scolia*, p. 173, no. 176, ♀, nec Klug, 1832.

♀. Black, the abdomen dorsally orange, with black or reddish markings, beneath reddish brown, infuscated apically. Pubescence of head, thorax, legs, and base of abdomen grey, becoming somewhat yellowish on legs; tergal fringe golden; appressed pubescence of last tergite coppery brown. First segment of the abdomen anteriorly black, dorsally orange; second, third, fourth, and fifth tergites orange (cadmium-orange), shading into yellow; an oblique oval brown spot on the sides of tergites 2 and 3; a transverse crescentic reddish mark before the apex of these segments, mesad of the oblique brown marks; fourth tergite with an indefinite narrow brownish cross-band, laterad of which there is an oblique reddish mark; fifth tergite with brown sublateral spots. The underside of the abdomen varies from yellow to red-brown, becoming black at apex. Wings smoky, with a deep brown area along the costal margin, involving the marginal and first submarginal and base of the median cells. The wings are somewhat opalescent, but without a strong violaceous reflection.

The clypeus is smooth above, its inferior half with coarse longitudinal wrinkles; vertex, temples, and front above the emargination of the eyes polished and nearly impunctate; a few punctures around the ocelli and along the inner margin of the eyes; front between and above the antennæ and extending into the emarginations of the eyes coarsely punctate; disc of mesonotum impunctate, the balance with sparse coarse punctures; scutellum impunctate, except a few coarse punctures at base and sides; postscutellum essentially impunctate; dorsal surface of propodeum also polished and with a very few punctures, produced into a median point, but not separated from the truncate posterior surface by a ridge; the posterior surface smooth, polished, and essentially impunctate; the calcaria of the posterior tibiæ slightly spatulate, yellowish white in colour.

*Type.*—Cornell University, no. 849.1, from Lourenço Marquez, Portuguese East Africa, collected by Herman Junod. Paratypes as indicated below.

*Distribution*:—

South-west Africa: Kunene River, Otjimbumbe, 1 ♀, March 1923 (*Museum's S.W. Afr. Exped.*, S. Afr. Mus.).

Union of South Africa: "Kapland," 1 ♀ (*S. Dredge*, Berlin Mus.).

Pondoland: Port St. John, 1 ♀, 25–31 March, 1923, 4 ♀ ♀, 15–31 May, 1923 (*R. E. Turner*, Brit. Mus.).

Natal: Malvern, 1 ♀ (*J. B. Cregoe*, Brit. Mus.); Durban, 1 ♀ (Brit. Mus.); Tsera (*sic*?), 1 ♀, 1893 (*G. Marshall*, S. Afr. Mus.).

Transvaal: Shilowane, 1 ♀ (*H. Junod*, Coll. Schulthess).

Portuguese East Africa: Lourenço Marques, 27 ♀ ♀ (*H. Junod*, Cornell Univ.); Rikatala, 4 ♀ ♀ (*H. Junod*, Coll. Schulthess); Delagoa Bay, 6 ♀ ♀ (*R. Monteiro*, Berlin Mus.), 1 ♀ (Brit. Mus.); Masiene, 2 ♀ ♀, Dec. 1923 (*R. F. Lawrence*, S. Afr. Mus.); Inhaca, 1 ♀, Oct. 1912 (*K. H. Barnard*, S. Afr. Mus.); Inhambane, 1 ♀ (*Peters*, Berlin Mus.); Beira, 1 ♀ (*P. A. Sheppard*, Brit. Mus.); Mozambique, 1 ♀ (Paris Mus.); Pungwe River Valley, Guengere, 1 ♀, Dec. 1906 (*G. Vasse*, Paris Mus.); Prov. of Gorongoza, Tendos du Sungoue et Riv. Vunduzi, 120 ft., 1 ♀, 1907 (*G. Vasse*, Paris Mus.).

Mashonaland: Salisbury, 4 ♀ ♀, Apr. 1900 (*G. A. K. Marshall*, Brit. Mus.); Salisbury, Arcturus, 1 ♀, 1917 (*Melle*, S. Afr. Mus.).

Nyasaland: Chiromo, 1 ♀ (*R. C. Wood*, Brit. Mus.); Mlanji, 35 ♀ ♀, every month from Nov. to June inclusive, 1912, 1913, 1914 (*S. A. Neave*, Brit. Mus.); side of Mt. Mlanji, 3000–4000 ft., 1 ♀ (*S. A. Neave*, Brit. Mus); Mlanji Boma, 2400 ft., 3 ♀ ♀, 26–30 Apr. and 3–5 May, 1910 (*S. A. Neave*, Brit. Mus.); south-west of Lake Chilwa

(Schirwa), 1 ♀, 16 Jan. 1914 (*S. A. Neave*, Brit. Mus.); Shire Valley, 2 ♀ ♀, Aug. 1913 (*S. A. Neave*, Brit. Mus.); Lingadzi, near Domira Bay, 1500 ft., 1 ♀, 1 July, 1907 (*W. A. Lamborn*, Brit. Mus.).

NORTH-EASTERN RHODESIA: Upper Luangwa River, 2 ♀ ♀, 27 July–13 Aug. 1910 (*S. A. Neave*, Brit. Mus.); Middle Luangwa River, 1 ♀, 14–16 Aug. 1900 (*S. A. Neave*, Brit. Mus.).

TANGANYIKA: Lake Nyasa, Langenburg, 2 ♀ ♀ (*Füllerborn*, Berlin Mus.); Pale, 1 ♀, 23 Nov. 1909 (*S. Schroder*, Berlin Mus.); Bagamoyo, 1 ♀ (Paris Mus.); Lake Victoria, Bukoba, 1 ♀, 9–11 June, 1912 (*C. C. Gowdey*, Brit. Mus.).

BELGIAN CONGO: Lake Tanganyika, Albertville, 1 ♀, Dec. 1918 (*R. Mayne*, Congo Mus.); Kalembelembe-Baraka, 3 ♀ ♀, 18 July (*R. Mayne*, Congo Mus.); Bambili, 1 ♀ (*Rodhain*, Congo Mus.); Bambuli, 1 ♀, 1915 (*R. Mayne*, Congo Mus.); Ubangi Distr., Duma, 1 ♀, 26 Sept. 1910 (*H. Schwartz*, Berlin Mus.).

ZANZIBAR: Mwera River, 1 ♀, June 1904 (*Ch. Alluaud*, Paris Mus.).

KENYA: Mombasa, 2 ♀ ♀, 12–13 Feb. 1912 (*S. A. Neave*, Brit. Mus.); Rabai, near Mombasa, 1200 ft., 1 ♀, 15 Mar. 1912 (*S. A. Neave*, Brit. Mus.); Witu, 1 ♀, 28 Feb. 1912 (*S. A. Neave*, Brit. Mus.); Kibwezi, 3000 ft., 1 ♀, 24 Apr. 1911 (*S. A. Neave*, Brit. Mus.); Shimba, 1 ♀, July 1912 (*A. D. Milne*, Brit. Mus.); Lake Naivasha, Masai Reserve, 6000 ft., 1 ♀, 20 Feb. 1913 (*A. O. Luckman*, Brit. Mus.); Lake Victoria, S. Kome Forest, 1 ♀, 7 Jan. 1919 (*G. D. H. Carpenter*, Brit. Mus.); Mogorre, 1 ♀ (*A. O. Luckman*, Brit. Mus.); Nasisi Hills, 20 miles north of Mumias, 4800 ft., 1 ♀, 14–15 June, 1911 (*S. A. Neave*, Brit. Mus.).

UGANDA: Victoria Nyanza, Island of Nsazi, 1 ♀, 16 Feb. 1919 (*G. D. H. Carpenter*); Victoria Nyanza, Archipelago of Sesse-Bugala, 9 ♀ ♀, 1908 (*E. Bayon*, Mus. Genoa); west shores of Victoria Nyanza, Buddu, 3700 ft., 18 ♀ ♀, 19–25 Sept. 1911 (*S. A. Neave*, Brit. Mus.); Katona (*i. e.*, Katoma?), 1 ♀, Mar. 1909 (*Shirati*, Hungarian Nat. Mus.); Victoria Nyanza, Entebbe, 5 ♀ ♀, 15–22 Aug. 1911, 24 ♀ ♀, every month Jan.–May and Aug.–Nov. inclusive, 1913–1914 (*C. C. Gowdey*, Brit. Mus.); (forest), 3800 ft., 1 ♀, 3–11 July, 1911 (*S. A. Neave*, Brit. Mus.); Eastern Mbale Distr., south of Mt. Elgon, 3700–3900 ft., 1 ♀, 3–5 Aug. 1911 (*S. A. Neave*, Brit. Mus.); Lake Kioga, between north-east shore and Kumi, 3400–3600 ft., 1 ♀, 18–20 Aug. 1911 (*S. A. Neave*, Brit. Mus.); south of Lake Salisbury, Mbale–Kumi Road, 3700 ft., 1 ♀, 15–17 Aug. 1911 (*S. A.*

*Neave*, Brit. Mus.); banks of Nile near Kakindu, 3400 ft., 1 ♀, 24–25 Aug. 1911 (*S. A. Neave*, Brit. Mus.).

Abyssinia: 1 ♀ (Paris Mus.); Harrar, 4 ♀ ♀, May 1911 (*R. E. Turner*, Brit. Mus.); Amhara, road from Agama to Simen, 1 ♀, June, 1831 (Frankfort Mus.); Maraquo, 2 ♀ ♀, Nov. 1914 (*O. Kovacs*, Brit. Mus.).

Eritrea: Saganeiti, 3 ♀ ♀ (Mus. Genoa).

Ubangi: Upper Ubangi River, upstream from Fort de Possel, Bessou Mission, 1 ♀, Sept. 1904 (*J. Decorse*, Mission Chari-Tchad, Paris Mus.).

Gabon: 1 ♀ (Brit. Mus.), 1 ♀, "Congo" (*Dybowski*, Paris Mus.).

Cameroons: 1 ♀ (*Sjöstedt*, Stockholm Mus.); Bibundi, 1 ♀ *, 4 Sept. 1904 (*S. G. Tessmann*, Berlin Mus.); Mokundange, 1 ♀ *, 16–31 May, 1905 (*S. G. Tessmann*, Berlin Mus.).

Southern Nigeria: Ibadan, Olokemeji, 4 ♀ ♀ (Bishop Mus.).

Northern Nigeria: 1 ♀, 14 Nov. 1911 (*J. W. S. Macfie*, Brit. Mus.); Kano, Azare, 1 ♀, 4 Sept. 1925 (*Ll. Lloyd*, Brit. Mus.).

Sierra Leone: 1 ♀ (*Mocquerys*, Paris Mus.); 1 ♀ (*W. G. Clements*, Brit. Mus.); Mongheri, 1 ♀, 15 Sept. 1912 (*J. J. Simpson*, Brit. Mus.).

Portuguese Guinea: Boama, 8 ♀ ♀, June–Dec. 1899 (*L. Fea*, Genoa Mus.).

Gambia: 3 ♀ ♀ (Brit. Mus.).

Senegal: 1 ♀ (Paris Mus.); Dakar, 1 ♀, 1905 (*G. Melou*, Paris Mus.), 1 ♀, 1907 (*Waterlot*, Paris Mus.).

### *Campsomeris aureoloides congoensis*, var. nov.

First tergite entirely black except for a small spot at extremity of each side, the second with a sinuate black band occupying (except at sides) the basal two-thirds, the third and fourth with narrower black basal bands; venter entirely piceous. Wings moderately deeply fuscous throughout. In all other respects like the typical form.

One paratopotype has a transverse yellow line near the apex of the first tergite. The paratypes have the black areas of the second, third, and fourth tergites reduced.

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* These two specimens bear determination labels by R. E. Turner as "*aureola*, Klug," and are recorded as *Scolia* (*Dielis*) *aureola*, Klug, by Turner in "Zool. Ergebnisse der Expedition des Herrn G. Tessmann nach Sud-Kamerun und Spanisch-Guinea," Mitt. Zool. Mus. in Berlin, 1911, iii. p. 392.

*Types.*—Holotype, from Banana, Belgian Congo, in the American Museum of Natural History. Paratypes as indicated below.

*Distribution*:—

Belgian Congo: Banana, 4 ♀♀, Aug. 1915 (*Lang & Chapin*, Amer. Mus. Nat. Hist. and Cornell Univ.); Nyangure, 1 ♀, 3 Apr. 1918 (*R. Mayne*, Congo Mus.); Mission Saint Gabriel, 1 ♀ (*H. Kohl*, Congo Mus.); Eala, 1 ♀, 22 July, 1914 (*R. Mayne*, Congo Mus.).

Middle Congo: Ndjole, 2 ♀♀, Nov., Dec. 1902 (*L. Fea*, Genoa Mus.); Brazzaville (environs), 1 ♀, 1907 (*E. Roubaud & A. Weiss*, Paris Mus.).

Gabon: Fernand Vaz, 3 ♀♀, Nov., Dec. 1902 (*L. Fea*, Genoa Mus.); Talagoula, near N'jole, 2 ♀♀, 1906 (*R. Ellenberger*, Paris Mus.).

Sierra Leone: 1 ♀ (*Mocquerys*, Paris Mus.).

*Elis felina*, Saussure (Stettiner entomologische Zeitung, 1859, xx. p. 265), was described from a female and a male from "La Caffrerie" from specimens in the Stockholm Museum. In the collection of that museum I find one female and four males labelled "Caffraria, J. Wahlberg," and the female has the Boheman manuscript pin-label "*Elis felina* ♀, Saussure." I have selected and hereby designate this female as lectotype, and have so marked it on a red pin-label, which I have attached to the specimen in the Stockholm Museum. As above indicated, it is identical with *curvivittata*, Cameron.

*Scolia aureola*, Klug ('Symbolæ physicæ, seu icones et descriptiones insectorum, quæ ex itinere per Africam borealem at Asiam F. G. Hemprich et C. H. Ehrenberg studio novæ aut illustratæ redierunt,' xx. pl. xxvii. fig. 11), was described from a single female from Ambukohl. There is a specimen in the Berlin Museum which bears the Klug manuscript pin-label "Ambuk. Ehrbg." and also "*Aureola*, Klug," and a printed type-label together with the number 6045. This specimen has the mesonotum medially destroyed, but seems unquestionably to have been medially impunctate. The legs and under surface of the abdomen are red. This specimen I hereby designate as lectotype of *aureola*, Klug, and have so marked it with a red label, which I have placed on the pin of the specimen in the Berlin Museum. In that museum there remain three other specimens which may be paratypes, but which are in reality not of the same species.

### *Key for distinguishing Females of* Campsomeris aureola, *Klug,* felina, *Saussure, and* aureoloides, *sp. n.*

| | | |
|---|---|---|
| 1. | Disc of clypeus smooth above the middle; the anterior border with coarse wrinkles; mesonotum impunctate medially | 2. |
| | Disc of clypeus, except sometimes at base, longitudinally canaliculate; mesonotum uniformly, moderately, densely, and coarsely punctate throughout | *felina,* Saussure. |
| 2. | Dorsal surface of propodeum produced medially behind into a point; vertex, front above temples, and dorsum polished and essentially impunctate; the vertex with only a single row of setæ bordering the occiput; the sides and front of mesonotum with a few sparse punctures; occasionally the dorsal surface of the propodeum with a few coarse scattered punctures | *aureoloides,* sp. n. |
| | Propodeum truncate, its dorsal surface separated from the posterior by a transverse ridge, no median tubercle, both dorsal and posterior surfaces uniformly punctate throughout | *aureola,* Klug. |

### *Campsomeris aureola* (Klug).

This is the North African species referred to by Turner in the paragraph quoted at the beginning of this paper. The typical form occurs in Nubia, Sudan, Tunis, Uganda, and India.

### *Campsomeris felina* (Saussure).

This is a rare species, which occurs in Natal and Nyasaland.

## XX.—*A Contribution to the Knowledge of the Spiders of South Wales.* By W. S. Bristowe, B.A., F.Z.S.

Our knowledge of the Spider fauna of South Wales is so scanty that the present small contribution needs no excuse. At the beginning of August 1929 a few days were spent at Brecon, primarily with the object of climbing and collecting on the Brecon Beacons, and excursions were made from here to Llandovery (Carmarthen) and Abergavenny (Monmouth). The number of species collected amounted to 68—54 from the county of Brecknock, 32 from Carmarthen, and 18 from Monmouthshire. I have not searched the literature for stray records, but, so far as I am aware, this is the first list of species collected in any of these counties. Dr. A. R. Jackson has made collections in the two adjoining counties of Glamorgan and Pembrokeshire, and he has recorded 190 species for the former and 94 for the latter *. On brief visits that I have paid to Pembrokeshire in May 1929 and June 1930 I have added 51 species to his list, making a total for that county of 145.

No very unusual spiders were collected in the course of my visit to Brecon, but amongst the more uncommon were the following :—*Dictyna pusilla*, Thor., *Linyphia hortensis*, Sund., *Lephthyphantes pallidus*, Camb., *Hilaira excisa*, Camb., and the Phalangid *Nemastoma chrysomelas*, Herm. Amongst the rarer species in the list of additions to Pembrokeshire are *Bathyphantes approximatus*, Camb., *Typhocrestus digitatus*, Camb., *Oxyptila scabricula*, Westr., and *Trochosa leopardus*, Sund. It would appear that *Dictyna pusilla*, Thor., and *Oxyptila scabricula*, Westr., are new records for Wales, and some of the commoner species also may have been overlooked.

On August 4th I set out in the rain to climb the Brecon Beacons, but, as the day went on, the weather improved and splendid views were obtained from the summit. The ranges forming the Beacons all connect up by ridges, and the highest point has an altitude of 2910 ft. There are rugged cliffs and dwarf gorse clumps, but for the most part the slopes are clothed with grass right to the summit. I did not find any very marked difference between the spiders at the summit and on the lower slopes.

Below 2000 ft. I found the following :—

*Cœlotes atropos*, Walck.
*Lephthyphantes zimmermannii*, Bertk.
*Oreonetides abnormis*, Bl.
*Tapinopa longidens*, Wid.
*Diplocephalus fuscipes*, Bl.
*Pœciloneta globosa*, Wid.
*Lycosa pullata*, Clerck.
—— *tarsalis*, Thor.

Above 2000 ft., where I spent more time collecting, the following were caught :—

*Cœlotes atropos*, Walck.
*Robertus lividus*, Bl.
*Lephthyphantes zimmermannii*, Bertk.
—— spp. ? (probably 2) imm.
*Pœciloneta globosa*, Kulcz.
*Stemonyphantes lineatus*, Linn.
*Centromerus bicolor*, Bl.
*Lophomma herbigrada*, Bl.
*Lycosa pullata*, Clerck.

. . . . . . . . . .

*Mitopus morio*, Fabr.
*Nemastoma chrysomelas*, Herm.

These are species which have been found on mountains (as well as at lower levels) elsewhere in Great Britain, and none are rare.

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* 'Cardiff Naturalists' Society Transactions,' vol. xxxix. 1907; vol. lv. 1925, p. 46.

## *List of Species from Brecknock, Carmarthen, and Monmouthshire.*

### ARANEÆ.

*Segestria senoculata*, Linn. Abergavenny; failed to find it at Brecon.
*Harpactes hombergii*, Scop. Brecon; under Beech bark.
*Drassodes lapidosus*, Walck. Brecon.
*Clubiona reclusa*, Camb. In curled leaves with eggs mostly just hatched. Brecon; Llandovery; Abergavenny.
—— *comta*, immature. Brecon.
—— *lutescens*, Westr. Llandovery.
*Liocranum domesticum*, Wid. Immature specimen crawling along the street. Llandovery.
*Zora* sp., immature. Brecon; Abergavenny.
*Philodromus aureolus*, Walck. Brecon; Llandovery. With two batches of eggs in curled Ash leaves.
*Xysticus cristatus*, Clerck. Abergavenny.
*Tibellus* sp., immature. Brecon.
*Cœlotes atropos*, Walck. This was very common at Brecon and extended right to the top of the Beacons. I found it under stones, in banks, in crevices in tree-trunks, and in walls. In the first of these habitats it lives in a tube, whilst in the remainder the very round entrance or entrances to the tube, for this is sometimes forked, is surrounded by a wide "collar" of silk. Sometimes this extends into a small sheet-web of the *Tegenaria* type, but the greater density and slightly bluish shade of the silk round the entrance simplifies identification. The above notes might equally well have been written about this species' southern relation *Cœlotes terrestris*. In one nest I found two flattish circular egg-cocoons. One contained 45 large yellow eggs, the other newly-hatched young spiders. Brecon; Abergavenny.
*Tegenaria atrica*, C. L. K. Brecon; Llandovery.
*Amaurobius similis*, Bl. Brecon; Llandovery; Abergavenny.
—— *fenestralis*, Str. Brecon, Beech wood; Abergavenny, under bark.
—— *ferox*, Walck. Brecon.
*Dictyna pusilla*, Thor. Brecon; on gorse.
*Pholcus phalangioides*, Fuess. Llandovery; failed to find it in Brecon and Abergavenny.
*Theridion sisyphium*, Clerck. On holly, Brecon; with young on May, Llandovery.
—— *varians*, Hahn. With round white cocoon containing yellow eggs on garden railings, Brecon.
—— *ovatum*, Clerck. Abundant in curled leaves with its blue egg-cocoon. Bramble is the most popular leaf, but I noticed that on occasions Ash, Hazel, Maple, May, Convolvulus, and certain herbs were used. An analysis of the three varieties is as follows:—

| | White. | Striped. | Red-topped. |
|---|---|---|---|
| Brecon ............. | 54 | 6 | 2 |
| Llandovery .......... | 104 | 23 | 15 |
| Abergavenny......... | 73 | 23 | 2 |

*Steatoda bipunctata*, Linn. Brecon Cathedral.
*Robertus lividus*, Bl. Summit of Brecon Beacons.
*Linyphia clathrata*, Sund. Beech wood, Brecon.
—— *triangularis*, Clerck. Brecon; Llandovery.
—— *pusilla*, Sund. Llandovery.
—— *hortensis*, Sund. Beech wood, Brecon.

*Lephthyphantes ericæus*, Bl. Amongst grass, Llandovery.
—— *tenuis*, Bl. Brecon; Llandovery; Abergavenny.
—— *pallidus*, Camb. Amongst damp herbage, Llandovery.
—— *zimmermannii*, Bertk. Brecon Beacons—from base to summit.
*Bathyphantes gracilis*, Bl. Brecon; Llandovery.
—— *pullatus*, Camb. Brecon.
—— *nigrinus*, Westr. Llandovery, amongst herbage.
*Stemonyphantes lineatus*, Linn. Brecon Beacons; Abergavenny.
*Gonatium rubens*, Bl. Llandovery, amongst *Juncus*.
*Dismodicus bifrons*, Bl. Brecon.
*Œdothorax retusus*, Westr. Brecon.
—— *fuscus*, Bl. Llandovery.
*Lophomma punctatum*, Bl. Brecon.
—— *herbigrada*, Bl. Brecon Beacons.
*Hilaira excisa*, Camb. Llandovery, common amongst herbage.
*Erigone dentipalpis*, Wid. Llandovery, amongst herbage.
*Pœciloneta globosa*, Wid. Brecon Beacons.
*Centromerus bicolor*, Bl. Brecon Beacons.
*Diplocephalus fuscipes*, Bl. Brecon Beacons.
*Tapinopa longidens*, Wid. Brecon Beacons.
*Oreonetides abnormis*, Bl. Brecon Beacons.
*Ero* sp. imm., ?*furcata*, Vill. Brecon; Abergavenny.
*Pachygnatha degeerii*, Sund. Llandovery; Abergavenny.
*Epeira diademata*, Clerck. Brecon; Llandovery; Abergavenny.
—— *umbratica*, Clerck. Brecon.
—— *sericata*, Clerck. Brecon, on bridge across river.
*Meta segmentata*, Clerck. Brecon; Llandovery; Abergavenny.
*Zilla x-notata*, Clerck. Brecon; Llandovery; Abergavenny.
*Pisaura mirabilis*, Clerck. Brecon; Llandovery.
*Lycosa amentata*, Clerck. Brecon; Llandovery.
—— *pullata*, Clerck. Brecon.
—— *tarsalis*, Thor. Brecon.
—— *nigriceps*, Thor. Brecon.
*Pirata piratica*, Clerck. Brecon; Llandovery.
*Trochosa terricola*, Thor. Brecon.
*Tarentula pulverulenta*, Clerck. Brecon.
*Salticus scenicus*, Clerck. Llandovery.

### PHALANGIDEA.

*Phalangium opilio*, Linn. Brecon; Llandovery.
*Mitopus morio*, Fabr. Brecon; Llandovery.
*Liobunum rotundum*, Latr. Brecon; Llandovery; Abergavenny.
*Nemastoma lugubre*, Mull. Brecon; Llandovery; Abergavenny.
—— *chrysomelas*, Herm. Brecon Beacons.

## *List of Additions to Records for Pembrokeshire* *.

### ARANEÆ.

*Dysdera crocota*, C. L. K. Marloes.
*Oonops pulcher*, Templ. Skomer; Haverfordwest; Grassholm.
*Drassodes troglodytes*, C. L. K. Skomer; Marloes.

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* Most of these are incorporated in my papers on "The Spiders of Skomer Island" (Proc. Zool. Soc. 1929, p. 617), and "The Spiders of the Island of Grassholm, and some Additions to the Skomer Island List" (Proc. Zool. Soc. 1931, p. 111).

*Zelotes latreillii*, Sim. Skomer.
*Micaria pulicaria*, Sund. Skomer; Marloes.
*Chiracanthium carnifex*, Fabr. Skomer; Marloes.
*Clubiona reclusa*, Camb. Skomer.
*Oxyptila trux*, Bl. Skomer.
—— *scabricula*, Westr. Skomer.
*Xysticus cristatus*, Clerck. Skomer; Marloes.
*Pholcus phalangioides*, Fuess. Skomer; Haverfordwest; Marloes.
*Episinus* sp. Immature. Skomer.
*Pholcomma gibbum*, Westr. Skomer.
*Enoplognatha thoracica*, Hahn. Skomer; Marloes.
*Linyphia pusilla*, Sund. Haverfordwest.
*Lephthyphantes mengii*, Kulcz. Skomer.
*Bathyphantes concolor*, Wid. Skomer; Haverfordwest.
—— *approximatus*, Camb. Marloes.
*Centromerus bicolor*, Bl. Skomer.
*Ceratinella brevis*, Bl. Skomer.
—— *brevipes*, Westr. Skomer.
*Halorates reprobus*, Camb. Skomer.
*Typhocrestus digitatus*, Camb. Skomer.
*Dismodicus bifrons*, Bl. Skomer.
*Dicymbium nigrum*, Bl. Skomer; Haverfordwest.
*Wideria antica*, Wid. Skomer; Marloes; Grassholm.
*Lophocarenum parallelum*, Bl. Skomer; Grassholm.
—— *nemorale*, Bl. Skomer.
*Gongylidiellum vivum*, Camb. Grassholm.
*Walckenaera acuminata*, Bl. Skomer.
*Pocadicnemis pumila*, Bl. Skomer; Marloes.
*Oreonetides abnormis*, Bl. Skomer.
*Erigone longipalpis*, Sund. Marloes.
*Entelecera erythropus*, Westr. Marloes.
*Savignia frontata*, Bl. Marloes.
*Agyneta conigera*, Camb. Marloes.
*Epeira umbratica*, Clerck. Marloes.
—— *cornuta*, Clerck. Haverfordwest.
—— *adianta*, Walck. Skomer.
*Zilla x-notata*, Clerck. Skomer; Marloes; Haverfordwest.
*Pachygnatha clerckii*, Sund. Skomer.
*Amaurobius fenestralis*, Stroem. Skomer; Haverfordwest.
*Tegenaria derhamii*, Scop. Skomer.
—— *atrica*, C. L. K. Skomer.
*Textrix denticulata*, Oliv. Skomer; Marloes.
*Hahnia nava*, Bl. Skomer.
*Trochosa terricola*, Thor. Skomer; Haverfordwest; Grassholm.
—— *leopardus*, Sund. Skomer.

### PHALANGIDEA.

*Megabunus diadema*, Fabr. Skomer.
*Platybunus triangularis*, Herbst. Skomer.

### CHERNETIDEA.

*Obisium muscorum*, Leach. Skomer.

My thanks are due to Dr. A. R. Jackson for examining the greater part of my collection.

## XXI.—*The Dates of Publication of Wood (W.)*: ‘*Index Entomologicus*,’ 1833–1838. By Francis J. Griffin, A.L.A., Registrar of the Entomological Society of London.

Wood (William).

‘Index Entomologicus; or, a complete illustrated Catalogue of the Lepidopterous Insects of Great Britain.’

Pp. iv, Preface 1st issue, xii, T.P., Preface 2nd issue, directions to the Binder, errata, List of subscribers, 266, 54 pls. col. 8vo. London, 1833–1838.

Reissued as a complete volume 1839, which date the title-page bears.

I am indebted to Mr. Hy. J. Turner for the opportunity of examining from his Library a copy of this work with a complete set of the wrappers still enclosing their original contents. Each wrapper bears the year of issue and the date on which the next part will appear. The Preface has two issues, varying slightly in phraseology. The first issue has a curious mis-spelling of *Gonepteryx* (*Gompeteryx* sic), which has been corrected in the second issue. The second issue is much commoner, as it is the one issued with the complete volume in 1839. The first issue of the preface appeared in 1833. The copy is a composite one made up from three copies, of which the largest part was that of Lady Galway, an original subscriber.

So far as I can discover the correct dates of publication are as follows:—

No. 1. (? April) 1833. [Preface 1st issue] i.–iv. pp. 1–8, pls. 1–3.
2. (July) 1833. Pp. 9–24, pls. 4–6.
3. (Oct.) 1833. Pp. 25–32, pls. 7–9.
4. 29. i. 1834. Pp. 33–48, pls. 10–11.
5. 29. iv. 1834. Pp. 49–64, pls. 12–14 [pl. 13 wanting in this copy].
6. 1. viii. 1834. Pp. 65–72, pls. 15–16.
7. 1. xi. 1834. Pp. 73–88, pls. 17–19.
8. 1. ii. 1835. Pp. 89–96, pls. 20–21.
9. 1. v. 1835. Pp. 97–104, pls. 22–24.
10. 1. viii. 1835. Pp. 105–112, pls. 25–26.
11. 1. xii. 1835. Pp. 113–128, pls. 27–29.
12. 1. iii. 1836. Pp. 129–144, pls. 30–31.
13. 1. vi. 1836. Pp. 145–152, pls. 32–33.
14. 1. ix. 1836. Pp. 153–160, pls. 34–35.
15. 1. xii. 1836. Pp. 161–168, pls. 36–38.
16. 1. iii. 1837. Pp. 169–176, pls. 39–40.
17. 1. vi. 1837. Pp. 177–182, pls. 41–43.
18. 1. ix. 1837. Pp. 183–198, pls. 44–45 [pls. 44–45 wanting in this copy].
19. 1. xii. 1837. Pp. 199–214, pls. 46–47.
20. 1. iii. 1838. Pp. 215–222, pls. 48–49.
21. 1. vi. 1838. Pp. 223–230, pls. 50–51.
22. 1. x. 1838. Pp. 231–266, 3 pp. Adverts., pls. 52–54 [pl. 54 wanting in this copy].

## XXII.—*Note on* Palæospondylus gunni, *Traquair*.

By O. M. B. Bulman, Ph.D., A.R.C.S., D.I.C.

[Plate IV.]

### Introduction and Acknowledgments.

The structure and affinities of the Middle Devonian "fish" *Palæospondylus* have been discussed by such authorities as Traquair, Bashford Dean, Sollas, and Stensiö; and in venturing on to this disputed ground I may perhaps quote from the introduction to Professor and Miss Sollas's monograph, that if any fresh light is here thrown on to the subject it is entirely owing to the employment of a new method of research. Sollas demonstrated that the material now composing the skeleton of *Palæospondylus* is a carbonaceous substance closely resembling a true coal in bulk composition. This suggested that it should be possible to free the organic remains from the matrix by the use of suitable acids—in other words, to apply to this fossil the method of "transfer preparations." By this means the embedded and protected portion of the fossil is exposed to view, and, as with serial sections, the observer is no longer dependent upon chance exposure by the natural agencies of weathering. The method is not subject to the uncertainty of "smoothing over" the intervals between sections, but had nevertheless its own limitations. I have constantly checked my results by those of Professor and Miss Sollas, and gratefully acknowledge the assistance thus obtained in detecting deceptive appearances and in extending the range of reliable observation.

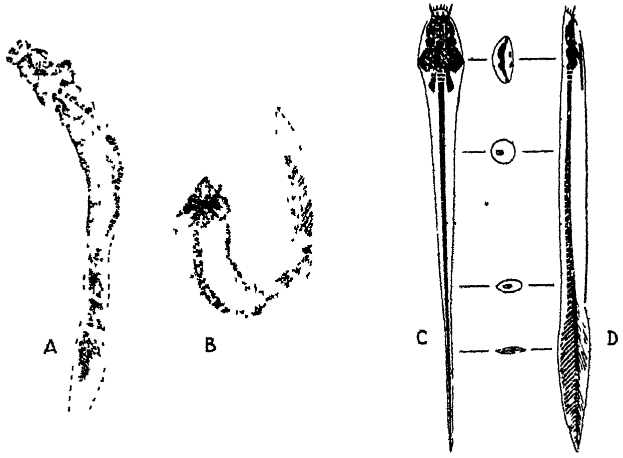
The material available for this work consisted of some thirty specimens, for which I am very greatly indebted to Mr. P. W. Murray Threipland; my thanks are also due to Professor D. M. S. Watson, F.R.S., for much helpful discussion and for his critical reading of the manuscript, and to my colleagues in the Zoological Department (Imperial College) for facilities to make a partial dissection of a recent Myxinoid.

The figured transfer preparations have been incorporated in the collections of the Geological Department, British Museum (Natural History).

### Method of Investigation.

The matrix (Middle Devonian, Caithness Flags, Achanarras Band) consists of a micaceous flaggy sandstone with a high proportion of interstitial calcite and some iron carbonate. Specimens, having been roughly trimmed, were immersed in dilute hydrochloric acid for one or two weeks, after which a rind of "rotted" flagstone extended inwards to a depth of about one-eighth of an inch, and all the lime had been leached out of the matrix surrounding the *Palæospondylus*. After washing and drying, the specimen was cemented face downwards to a glass slide with kollolith, a medium which was found to be easier for handling than Canada balsam. It was then possible, by inserting the edge of a sharp knife, to flake off the "unweathered" core—perhaps half an inch thick—and leave attached to the slide only the layer of rotted stone enclosing the fossil. By this means much time was saved in subsequent solution of the sandstone with hydrofluoric acid, a process rendered somewhat difficult on account of the abundant flakes of muscovite. It proved most satisfactory to remove these flakes with a very fine camel-hair brush under a high-power binocular as the sand-grains dissolved, and thus to expose the fossil by a combination of mechanical and chemical means. After washing and draining off the surplus water the fully exposed skeleton adhering to the glass was covered with three or four large drops of warm glycerine jelly, and a cover-glass lowered on to this; when the jelly had set, the preparation was completed by the application of several coats of gold size round the edges.

Text-fig. 1.



A, specimen 21, ×1½; B, specimen 14, ×2 approx. Two examples, with indications of body-form and caudal fin.
C, D, restorations of dorsal (C) and lateral (D) aspects, with cross-sections at the four levels indicated.

## General Form.

On several specimens a dark stain, indicating the form of the body, appeared on wetting the surface. Two such specimens are represented in text-fig. 1, A and B; in neither case is the outline entire, and the specimens are far from perfect, but they furnish a general guide for the restoration of the body-outline, as has been attempted in text-fig. 1, C and D. The body was evidently much depressed anteriorly and compressed laterally at the caudal fin and probably for some distance forwards from this in front of the anus. There are no traces of limbs nor of dorsal nor anal fins. The caudal fin in the reconstruction has been copied from that figured by Traquair in 1894 (pl. ix. figs. 6, 8).

## THE SKULL.

The skull, particularly in the region of the otic capsules, is flattened dorso-ventrally, and this is believed to be an original feature and not one due to serious compression. It was remarked by Sollas that, while certain pressure effects are evident, the amount of distortion is only slight, for in the better specimens the very delicate lateral walls of the cranium are in an erect undisturbed condition. Again, as Traquair observed (1893, p. 89) every specimen examined presents either a dorsal or more commonly a ventral aspect, and in no instance has a side-view been seen—that is, the remains invariably sank to rest with the dorsal or ventral surface uppermost, and the caudal fin alone could be turned over sideways. Such a constant *post mortem* arrangement of the animal requires an originally depressed form of the head-region.

### (a) *The Rostralia.*

The rostralia displayed in Traquair's figure (1894, pl. ix. fig. 1) are still the most perfect known; confirmation of the number and arrangement of these is furnished by Sollas's reconstructions from serial sections and by certain specimens among the material here described.

A ventral, lateral, and dorsal series can be made out, containing respectively four, two (paired), and five elements—a total of eleven processes. Sollas speaks of them as arising at different levels from the "ampyx," a thickened bar forming the anterior margin of the skull. For the ventral series this is undoubtedly the case, but from some of my own preparations, as well as from the appearance of Traquair's and several of Sollas's figures, it seems to me probable that the dorsal rostralia were attached, not to the ampyx itself, but to a separate bony loop arising from the sides of the ampyx. It is true that the rostralia tend to become detached and to occur slightly displaced, but in the present material, where traces of the dorsal series are found, they are all decidedly anterior to the ventral series and usually with some indication of being fused to a separate element. This arrangement is suggested by Traquair's figures (1894, pl. ix. figs. 1–4) and by pl. xvi. figs. 1, 2 of Sollas; possibly where the dorsal series appears to arise from the ampyx this is due to a crushing-down of the supporting ring on to the ampyx below. Moreover, Sollas suggests (p. 278) that the rostralia form a terminal fringe round the anterior aperture of the cranium.

The rostral ring must have sloped forwards somewhat, because the dorsal rostralia are never found behind the ventral, as might equally occur through slight pressure were the ring perpendicular; that is to say, as remarked by Stensiö, the "rostral processes seem to be arranged in such a way that they surround an antero-ventrally directed unpaired opening"—an oval aperture which leads straight back into the *cavum cerebrale cranii.*

### (b) *Dorsal Surface of the Skull.*

The dorsal surface of the cranium is distinguished by a deep median groove extending throughout its length and representing the unroofed cranial cavity. Anteriorly the delicate cranial walls bounding this groove laterally rise sharply upward to a considerable height*. It may be that these walls sloped slightly inwards, because in more compressed specimens they are always folded together over the cranial cavity, and not both turned to right or to left. Posteriorly the boundaries are not clearly defined, and the brain-cavity is limited only by the broad ridges of the otic capsules.

The floor of the cranial cavity anteriorly, where it should more properly be termed the rostral cavity (Stensiö), is generally incomplete, and specimens of which the dorsal side has been prepared (and the ventral side has weathered away) almost invariably show a rather irregular perforation here (*f*, text-figs. 3, 5). This is probably the anterior opening (*a.o.*) described by Bashford Dean. On the other hand, specimens of which the ventral side has been prepared always show a continuous ossified base to the cranium except for two small foramina in the angles of the "tauidion." In the present reconstruction, therefore, I have indicated a median opening (*f*, text-fig. 5) in the floor of the rostral cavity, which is partially closed ventrally by the tauidion and by it divided into two minute foramina; the significance of these is not apparent.

The floor rises noticeably at about the level of the beginning of the otic capsules, and the deeper anterior portion is interpreted by Sollas and Stensiö as the *fossa hypophyseos* (*foss.hyp.*, text-figs. 2, 3, 5), bounded posteriorly by the *dorsum sellæ* (*d.sell.*).

A large foramen (*II*, Pl. IV. fig. 1, text-figs. 2, 3, 5) occurs in each lateral wall at a point midway between the hemidomes (*h*) and the otic capsules (*o.c.*), which, following Sollas, we may with confidence refer to the exit of the optic nerve II. Just behind this the thin well-marked cranial walls descend sharply and merge into the rounded, less distinct walls of the otic region; between the two is a broad groove which perhaps marks the exit of nerve v. and possibly also of nerve vii. This groove is clearly seen also in fig. 1, pl. xvi. of Sollas.

Behind this again is another broad groove, which is discussed by Sollas, who is of the opinion that, while such a connection between the ear-capsules and the brain is characteristic of some Teleosts, it might be due to changes after death in *Palæospondylus*. At the extreme posterior the cranial walls rise abruptly again, and to them is frequently found attached the neural arch of the first vertebra.

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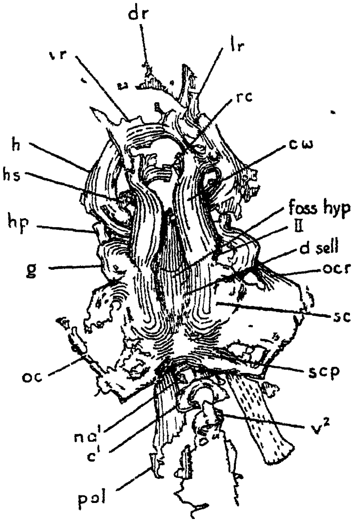
* Sollas cites cranial walls 1 mm. high in a skull 5·3 mm. in length.

Lateral to the anterior end of the cranial cavity and the rostral cavity are the structures named hemidomes (*h.*) by Sollas (the "trabeculo-palatine lobes" of Traquair). Each consists of a curved rod attached to the base of the cranium posteriorly and confluent with the ampyx in front; the semicircular space thus enclosed is divided by a transverse septum (the hemidome septum, *h.s.*) connecting the outer wall of the hemidome with the side of the head.

Text-fig. 2.

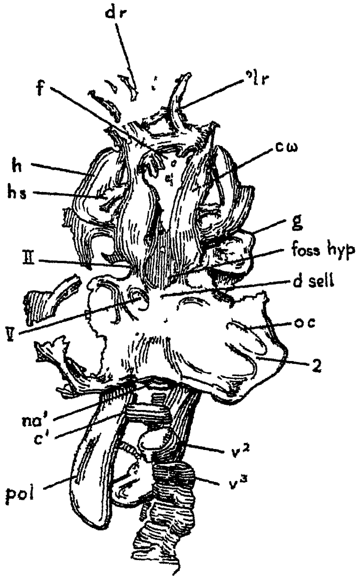


Dorsal surface of the skull, specimen P. 16122, B.M.N.H., ×10 approx. $c^1$, centrum of first vertebra; *c.w.*, thin anterior cranial wall, crushed inwards; *d.r.*, dorsal rostralia; *d.sell.*, dorsum sellæ; *foss.hyp.*, fossa hypophyseos; *g.*, gammation; *h.*, hemidome; *h.p.*, hemidome process; *h.s.*, hemidome septum; *l.r.*, lateral rostralia; *n.a*$^1$, neural arch of first vertebra, detached from centrum and associated with otic region of skull; *o.c.*, otic capsule; *o.c.r.*, thickened rim of otic capsule; *p.o.l.*, postoccipital lamella; *r.c.*, rostral cavity; *s.c.a.*, ? ridge bounding anterior semicircular canal; *s.c.p.*, ? ridge bounding posterior semicircular canal; *v*$^2$, second vertebra; *v.r.*, ventral rostralia; *II*, position of optic nerve.

The present material seems to agree entirely with Sollas's description, that the anterior compartment thus produced is roofed over by a thin sheet of bone, while the posterior compartment is open; both seem to be open ventrally. This curved rod of the hemidome is perhaps reminiscent of the cornual cartilage of *Myxine*.

Posterior to the hemidomes on either side is a small plate with a thickened rim anteriorly and laterally, the gammation (*g.*) of Sollas and the "additional lobe" of Traquair. This occurs just below the optic foramen, and, as Sollas observed, seems to be more closely connected with the hemidome than with the otic capsule behind, "with which, indeed, it never appears to come actually in contact." Stensio (p. 377) regards the orbital floor (*i.e.*, the gammation) and certain lateral parts of the ethmoidal region as perhaps of visceral origin, and thus comparable with the subocular arch in the Petromyzontids and Myxinoids.

Text-fig. 3.



Dorsal surface of the skull, specimen P. 16123, B.M.N.H., ×10 approx. *f*, foramen in rostral cavity; *V*, groove possibly indicating position of nerve v.; 2, trace of subotic rod 2, pressed through the otic capsule from below. Other lettering as in fig. 2.

The otic capsules are trapezoidal in outline and constitute the broadest portion of the skull. Each consists of a thin sheet of bone with swollen margins, thickening also on the inner side to two large and ill-defined ridges; one of these (*s.c.a.*) extends approximately anteriorly and posteriorly, converging slightly towards the mid-line behind, and forming the demarcation of the cranial cavity, while the other (*s.c.p.*) extends outwards and constitutes the thickened posterior margin of the skull. These two ridges are at right angles to one another, and Sollas records (but only in one instance) possible traces of semicircular canals assothe transfer preparations, and the ear-capsule, as seen in the fossil, is very shallow to have housed a labyrinth. While it is possible that these ridges bounded an anterior and posterior semicircular canal, it would seem equally possible that this otic region represents only the lower part of the capsule, bearing the impress of the sacculus, and that the dorsal part, being membranous or composed of uncalcified cartilage, is unpreserved. Were the latter alternative correct, traces of the canals and the foramen of the eighth nerve could not be expected in the fossil.

### (c) *The Ventral Surface of the Skull.*

Anteriorly the ventral surface is formed by the bases of the hemidomes, which give off a blunt process (*h.p.*) posteriorly, and by the base of the rostral cavity, closely applied to which is the peculiar T-shaped element named by Sollas the tauidion (*T*). The transverse bar of the tauidion lies just behind the so-called ampyx or anterior rim of the cranium, and the median rod extends backwards to a point midway between the hemidome septum and the posterior rim of the hemidome. This element is well seen in Pl. IV. fig. 2, in Sollas's reconstructions, and in many of Traquair's figures; but it is frequently indistinctly marked off from the base of the skull. In the re-entrant angles are two foramina which probably pass upwards, and, uniting above the tauidion, form a single foramen in the base of the rostral cavity.

Below the gammation on each side is an element named the trapezium (Sollas); on the anterior and posterior edges of this are two well-marked ridges, the anterior and posterior trapezial bars (*t.a.* and *t.p.*). In transfer preparations the trapezium itself is only vaguely seen, and appears to be fused with the base of the skull, but the two bars form conspicuous features. The anterior bar is shorter and much narrower and lies near to the mid-line; from serial sections it is known to be pierced by a foramen, so that it is attached to the base of the skull only at its extremities. The posterior bar is less sharply defined, but is much larger, and forms a conspicuous ovoid swelling.

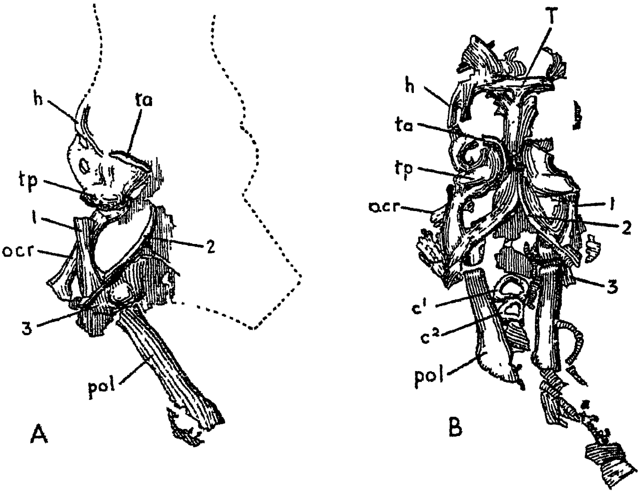
Behind the trapezium the base of the skull is formed by a continuous bony sheet beneath the otic capsules, and underlying this is a remarkable series of rod-like elements. By Sollas these were considered to be branchial arches, and by Stensiö the ridges on the ventral side of the neurocranium corresponding to the interbranchial ridges of the Cephalaspids.

Sollas identified four pairs of arches, noting that the second and third pair meet each other beneath the base of the skull behind the tauidion; the second and third bars on each side coalesce near their posterior extremities; and the fourth pair is directly related to the postoccipital lamellæ as though by an articular union. Of these four pairs the first is the least distinct, and in transfer preparations it appears to be merely the thickened anterior rim of the otic capsule (*o.c.r.*). On this view it is not in any way connected with the remaining three pairs, which are here numbered 1 to 3.

The first pair of these (1) is short, strong, and has every appearance of being an independent element. Anteriorly the termination is expanded, as though for articulation with the posterior trapezial bar; posteriorly it either fuses with the second bar or is at least attached to it by a broadened edge. I have not observed any specimens in which the two bones of this pair meet each other in the mid-line.

The second pair (2) is the longest and most slender; it has the form of a flattened lamella, meeting its fellow anteriorly and curving outwards posteriorly towards the angles of the otic capsules. In many specimens it appears to have been applied to the base of the skull, but this appearance is probably deceptive (*e.g.*, text-fig. 4, A).

Text-fig. 4.



**Ventral surface of the skull, ×10 approx. A, specimen P. 16124, B.M.N.H.; B, specimen P. 16125, B.M.N.H.**

**$c^1$, centrum of first vertebra; $c^2$, centrum of second vertebra; *h.*, hemidome; *o.c.r.*, thickened anterior rim of otic capsule; *p.o.l.*, postoccipital lamella; *T*, tauidion; *t.a.*, anterior trapezial bar; *t.p.*, posterior trapezial bar; 1, 2, 3, subotic rods.**

The third pair (3) is short, broad and flattened, somewhat L-shaped, and bearing at the angle a large tubercle which is clearly related to the postoccipital lamella. It may have been attached to the edge of the second pair by the short limb of the L (Pl. IV. fig. 2).

The arrangement and appearance of these elements—the possible articulation of bar 1, the fusion of bars 1 and 2, and the articulation of the postoccipital lamella to bar 3—seems to the writer

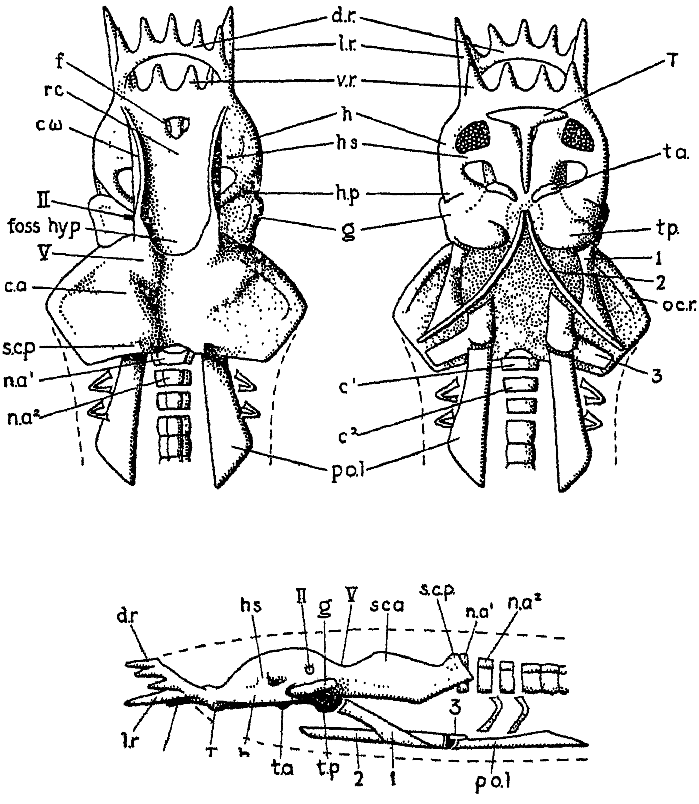
It appears equally definite, however, that they were discrete elements and not merely ridges on the base of the cranium, as was suggested by Stensiö on the evidence of published figures.

The postoccipital lamellæ (*p.o.l.*) are free in all observed specimens; the anterior end is expanded and would readily articulate with the tubercle on bar 3; the posterior end is flattened and broadened. At what angle and in what precise relationship these elements were set is difficult to decide. In the reconstruction (text-fig. 5) the articular facet on bar 3 faces largely downwards (as in the actual specimens), so that the postoccipital lamellæ might easily have been attached ventrally; but they were almost certainly internal structures, and can scarcely have formed a large angle with the axis of the cranium. Their function has been the subject of much speculation. Traquair believed that they "may have been in some way concerned in the support of the branchial apparatus"; Dean remarked that they may well have been ventral structures, and seems to have anticipated (with a negation) the suggestion that they represent the cranial ribs of lung-fish; Sollas considered that they might be modified branchial arches, perhaps functioning to assist in securing the head to the vertebral column; and Stensiö (interpreting the subotic rods as the dorsal interbranchial ridges) suggested that they might be comparable to the pronephros lamellæ of Cephalaspids. Yet another suggestion is advanced below.

If the subotic rod structures are no longer to be regarded as either branchial bars or as interbranchial ridges, the position of the gills is again open to question. The bases of the hemidomes seem too restricted in area and too far forward for this purpose; the trapezial elements have no obvious association. Most probably, then, the gill-pouches would occupy a position behind the subotic rods and above the postoccipital lamellæ. Here, it may be mentioned, there are to be seen in many preparations certain rather indefinite, thin, "vermiform" rods entangled in the vertebræ and postoccipital lamellæ, which may be interpreted as the remains of delicate branchial cartilages (text-figs. 3, 4 B; Pl. IV. fig. 2). These may be, in fact, the "fin-rays" which Bashford Dean recorded as associated with the postoccipital lamellæ, and the existence of which Traquair consistently denied; but whereas there is no very definite evidence of more than two pairs in the material here described, Dean's figures show apparently as many as four or five pairs (Dean, pl. i. fig. 3), and they are for the most part situated—perhaps displaced—farther back. The enlargement of their terminations (mentioned by Dean) is suggestive of attachment at both ends, just as a branchial cartilage would be.

If this much be admitted, then the curious ventral rod-structure and the postoccipital lamellæ acquire a position at once suggesting a homologue of the segmented basal-plate cartilage of the Myxinoids. Perfect parallelism is scarcely to be expected in animals wherein the skeletal elements are so largely sesamoidal, but the group of subotic rods and postoccipital lamellæ in *Palæospondylus* might well have given attachment to various members of a "tongue"-muscle complex. The outstanding difference is the connection here, through the first pair of rods, between the "basal plate structure" and the base of the cranium. Perhaps such a connection never existed, in which case bars 1 and 2 would seem to correspond to the outer and inner bars of the anterior segment, bar 3 to the paired median segment, and the postoccipital lamellæ to the unpaired but deeply grooved posterior segment of the

Text-fig. 5.



Reconstruction of the skull of *Palæospondylus gunni*, Traquair, in dorsal, ventral, and lateral aspect.

$c^1$, $c^2$, centra of first and second vertebræ; *c.w.*, anterior cranial wall; *d.r.*, dorsal rostralia; *f.*, foramen in rostral cavity; *foss.hyp.*, fossa hypophyseos; *g.*, gammation; *h.*, hemidome; *h.p.*, hemidome process; *h.s.*, hemidome septum; *l.r.*, lateral rostralia; $n.a^1$, $n.a^2$, neural arches of the first and second vertebræ; *o.c.r.*, thickened anterior rim of otic capsule; *p.o.l.*, postoccipital lamellæ; *r.c.*, rostral cavity; *s.c.a.*, *s.c.p.*, ? ridges bounding anterior and posterior semicircular canals; *T*, tauidion; *t.a.*, *t.p.*, anterior and posterior trapezial bars; *v.r.*, ventral rostralia; *II*, position of

Myxinoid basal plate. In that event it may even be that the trapezial elements, in which Sollas thought the key to the interpretation of the affinities of *Palæospondylus* probably lay, represent the Myxinoid dental plate. But, apart from the strong appearance of an articular union, the remarkably constant position and relations of these elements in the fossil state suggest that there was some connection sufficient to prevent *post-mortem* drifting asunder of the ventral structures.

## THE VERTEBRAL COLUMN.

The vertebræ are well ossified, each consisting of a thin cylindrical bony centrum; enclosing a large notochordal lumen, and surmounted by a neural arch. Dean recognized several regions—cervical, thoracic, lumbar, and caudal,—considering there to be no neural arch on the cervical, a neural arch on the thoracic, a neural arch and spine on the lumbar, and neural and hæmal arches and spines on the caudal; but it is doubtful to what extent these regions are distinct. Neural arches are definitely present on the "cervical" vertebræ, but it appears from the published figures of Dean and Traquair that these arches do increase in height posteriorly in front of the caudal fin. From the evidence of serial sections the notochord is known to have been large and unconstricted.

It is well known that the first three vertebræ tend to be disarticulated and turned over on their sides; in the majority of specimens also the centra of these first vertebræ are distinctly shorter than those further back, and they are shown perceptibly separated from one another in this region in Traquair's reconstruction. These facts prompt the suggestion that in the neck-vertebræ the anterior half sclerotome alone ossified, the caudal half remaining cartilaginous, and that the decay of this cartilaginous "intercentrum" permitted the disarticulation and overturning in the anterior region.

The first vertebra has a larger neural arch than the others, and, as remarked by Sollas, this frequently remains attached to the back of the skull, while the corresponding centrum is displaced backwards, as though its association with the occipital region of the cranium had been more intimate than that with the centrum.

## AFFINITIES.

*Palæospondylus* has at various times been considered a Cyclostome (Traquair et auct.); a form representing a new class unallied to the Cyclostomes (Dean) or distantly so allied (Gill); a larval *Coccosteus* (attributed to Huxley); a larval Dipnoan (Graham Kerr); a form with Elasmobranch affinities (Sollas); and a larval Amphibian (Dawson). The subject is fully discussed by Bashford Dean and by Sollas. Latterly Stensiö has again, and with a welcome suggestion of finality, argued its Cyclostome affinities. The structural interpretation presented above does nothing to invalidate Stensiö's main contentions, and, if correct, would imply merely that *Palæospondylus* had advanced along the Pteraspidomorph line towards *Myxine* considerably further than was hitherto anticipated. This "advance" shows itself in the more posterior situation of the gill-pouches, probably accompanying the development of a rasping tongue, and in a very marked reduction of dermal ossification. It is, however, worthy of note that, like the Heterostraci and all the Cephalaspidomorphi, *Palæospondylus* possibly (on somewhat imperfect evidence) possessed two semicircular canals, whereas in the Myxinoids there is, of course, only one. This distinction between the Myxinoids and the Palæozoic Pteraspidomorphs is difficult to account for, but it is evidently held by Stensiö to be of less importance than the conformation of the ethmoidal region of the head and the disposition of the olfactory and hypophyseal sacs. Possibly much of the resemblance between *Palæospondylus* and the living Myxinoids is due to adaptive convergence, and it is not intended to suggest that this genus stands in the direct line of descent of the modern forms—in fact, the scheme of relationship drawn up by Stensiö is still as close as this new interpretation warrants.

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## EXPLANATION OF PLATE IV.

*Fig.* 1. Dorsal surface of a large skull of *Palæospondylus gunni*, Traquair, lacking the postoccipital plates. Specimen P. 16120, B.M.N.H. ×10 approx. Lettering as in text-figs. 2, 3, 5.

*Fig.* 2. Ventral surface of a small skull of *P. gunni*, Traquair. Specimen P. 16121, B.M.N.H. ×10 approx. Lettering as in text-figs. 4, 5.

# XXIII.—*On a Nematode Parasite of Pangolins.*

By H. A. Baylis, M.A., D.Sc.

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Von Linstow (1906) described, under the name of *Spiroptera orca*, a parasite from the stomach of *Manis pentadactyla* in Ceylon. Monnig (1924) referred to v. Linstow's species some specimens obtained from the stomach of *Manis temmincki* in the Transvaal, while Neveu-Lemaire (1927) described a form from *M.* (*Pholidotus*) *temmincki* under the name of *Protospirura hamospiculata.* The locality in this instance was not mentioned. Wishing recently to determine some old and poorly preserved specimens in the British Museum collection from *Manis tricuspis*, collected in Fernando Po, the writer compared them with the descriptions cited above, with the result that they were found to agree in most respects with the descriptions both of Monnig and of Neveu-Lemaire, but the armature of the mouth was too much eroded to be made out, and it was noticed that the two authors' descriptions of the lips showed rather striking discrepancies. Monnig states that " the lips are simple, not lobed, without teeth." Neveu-Lemaire describes the lips in the following terms:—" La bouche est terminale et entourée de deux lèvres latérales formées chacune de trois lobes, un médian et deux latéraux ; chacun de ces lobes porte sur sa face interne trois petites dents. . ." A figure is given in which three lobes, each bearing three teeth, are clearly indicated.

In order to solve, if possible, the problem presented by these two somewhat contradictory accounts, the writer communicated with both authors. Professor Monnig has been kind enough to present to the British Museum (Natural History) some of the specimens described by him as *Spiroptera orca*, and Professor E. Brumpt (during M. Neveu-Lemaire's absence abroad) has also very kindly presented some of the original specimens of *Protospirura hamospiculata* from his collection in the Laboratoire de Parasitologie, Paris.

Briefly stated, the main results of the writer's examination of the three sets of material mentioned are as follows:—

(1) The *Spiroptera orca* of Monnig and the writer's specimens from the West African Pangolin, *Manis tricuspis*, are identical with *Protospirura hamospiculata*, Neveu-Lemaire.

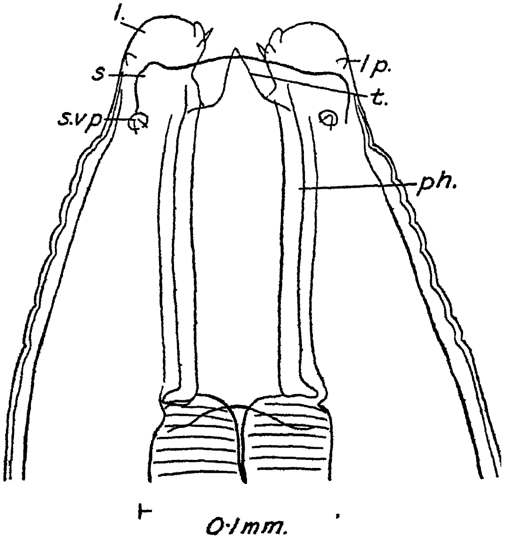
(2) The species *hamospiculata* does not belong to the genus *Protospirura*, but is referable to *Habronema*, Diesing, 1861, and should be called *Habronema hamospiculatum* (Neveu-Lemaire, 1927).

(3) From v. Linstow's description it appears very doubtful whether the form from Ceylon can be identical with that described by the other authors, though it is probably a member of the same genus.

It is not intended here to give a detailed redescription of *Habronema hamospiculatum*, but attention may be drawn to one or two special features.

*Form and Armature of the Lips.*—This being the most important question, it seems desirable to give here some camera-lucida drawings, made from M. Neveu-Lemaire's specimens and showing the writer's interpretation of these structures (figs. 1 & 2). It will be seen that the lips are paired, lateral and fairly large, but not trilobed. They are overlapped dorsally and ventrally by cuticular shields of the kind characteristic of the genus *Habronema*. Each lip bears on its internal surface usually seven teeth, arranged in three groups. In the middle of the lip is a group of three small, slender, pointed, forwardly-directed teeth (in one specimen on one lip four such teeth were seen, one of the outer teeth of the group being apparently duplicated so as to form two

Fig. 1.

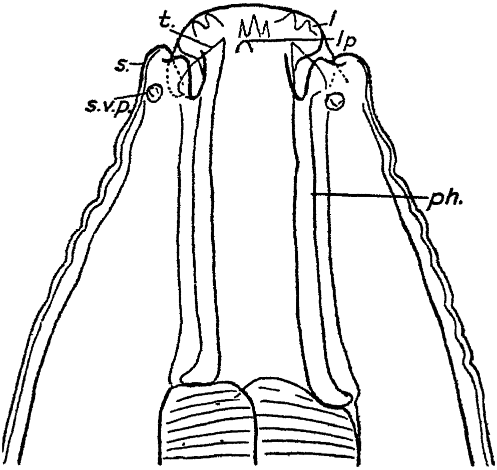


*Habronema hamospiculatum.* Anterior end of female; ventral view. *l.*, lip; *l. p.*, lateral papilla; *ph.*, pharynx; *s.*, ventral shield; *s.v.p.*, subventral papilla; *t.*, ventral tooth.

smaller teeth). At each of the outer (*i. e.*, dorsal and ventral) angles of the lip there are two rather larger and blunter teeth. In Prof. Monnig's specimens the lips are somewhat retracted and tightly closed together, which probably explains why the teeth were not observed. They can be detected in cleared specimens when one knows their appearance in a specimen with open lips.

The dorsal and ventral shields were presumably interpreted by M. Neveu-Lemaire as "lateral" (*i. e.*, dorsal and ventral) lobes of the lips, but his account of the teeth upon them seems to have been erroneous. Both authors mention the existence of two pairs of cephalic papillæ. Neveu-Lemaire states that these are at the bases of the four "lateral lobes." These are the subdorsal and subventral papillæ, and are situated near the corners of the dorsal and ventral shields. In addition, there is a pair of lateral papillæ, which do not seem to have been observed. These are small and inconspicuous, and are situated further forward, on the outer surfaces of the lips themselves. Within the dorsal and ventral shields, between the bases of the lips, and guarding

Fig. 2.



O·1mm.

*Habronema hamospiculatum.* Anterior end of female; lateral view. Lettering as in fig. 1.

the entrance to the mouth, there is a pair of large, conical, forwardly-directed teeth. These are formed by prolongations of the dorsal and ventral walls of the cuticular lining of the pharynx.

*Spicules of the Male.*—According to Neveu-Lemaire, the right spicule is the longer of the two. This is an error. As is more usual in Spiruridæ, the long spicule is that of the left side. When protruded, the spicules have a tendency to cross. Monnig correctly gives the left spicule as the longer, but states that it has a rounded point, while Neveu-Lemaire describes and figures the longer spicule as sharply pointed and barbed. The fact is that the left spicule is barbed in the manner shown by Neveu-Lemaire, not only in his material but also in that of Monnig, where the spicules (in the specimens seen by the writer) are retracted and therefore more difficult to see. By suitable manipulation of a well-cleared specimen it is, however, possible to see the barbed point. The much shorter and stouter right spicule has a little hyaline knob at its tip. The writer's measurements of the spicules (in three males from each source) gave the following figures :—

Neveu-Lemaire's material: left spicule 2·7–2·95 mm.; right spicule 0·56–0·6 mm.

Monnig's material: left spicule 3·0–3 175 mm.; right spicule 0·6–0·65 mm.

There is a small accessory piece, which does not seem to have been observed by either of the describers.

*Eggs.*—Both authors describe the eggs correctly as being slightly asymmetrical or flattened on one side. Monnig also states that they are slightly flattened at the poles. The outer portion of the shell has, in fact, the appearance of being cut off at each pole, leaving it covered with a thinner cap or operculum. The edges of the apertures are not, however, thickened to form raised hoops, as described and figured by v. Linstow for *S. orca*.

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# XXIV.—*The Genus* Diplectronella, *Ulmer* (*Insecta: Trichoptera*). By Martin E. Mosely, F.E.S.

The genus *Diplectronella* was created by Ulmer to include two species—*Diplectrona jacobsoni*, Ulm., and *Hydromanicus taprobanes*, Hagen, the latter having been placed originally in *Hydropsyche*. The main character on which Ulmer separated the new genus from *Diplectrona* was the absence of fork 1 in the posterior wings.

*D. jacobsoni* was described from a ♀ type (the ♂ continues unknown), and both sexes are known of *taprobanes*.

Two new species of this genus have been found amongst the British Museum accessions and the collections of the Imperial Institute of Entomology, the one from India and the other from Uganda, so that it is now possible to describe the genus rather more fully and to supply certain generic characters that have been omitted in Ulmer's brief note of the genus.

A good character which separates it from the very closely allied *Diplectrona* is the absence of the extraordinary internal organs to which I called attention in the description of *Diplectrona magna*, Mosely, which appeared in 'Eos,' tomo vi. cuad. 2, pp. 158–160 (1930). It may be mentioned again here that these organs are round convoluted bodies with a reticulated surface, usually four in number, but varying both in number and in shape in the different species, situated in the abdomen, and, needless to say, visible only in cleared balsam preparations. They occur in the male sex only.

In *Diplectronella* the genitalia are rather more simple than in *Diplectrona*, the intermediate appendages being apparently wanting. The genital characters in the three species of which the males are known present slight differences, but it is doubtful whether they could be made out with certainty from pinned and dried material, and it is safer in this genus to have specimens either preserved in fluid or else cleared in KOH when attempting their determination.

The neuration appears to be variable, and in the single example of *afra* from Uganda (a ♂) it is aberrant and the two sides do not correspond with each other.

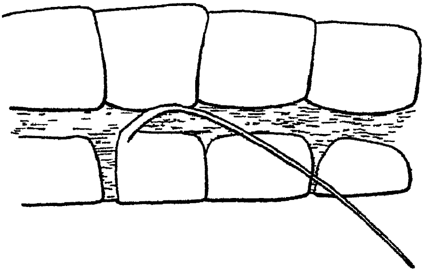
The drawings for this paper have been made by Mr. D. E. Kimmins.

### DIPLECTRONELLA, Ulmer. (Fig. 1.)

Maxillary palpi five-jointed in both sexes, basal joint very short; second joint longer and dilated, the lower margin rather convex, the apex truncate and carrying a tuft of strong hairs; third joint slightly shorter than the second, fourth slightly shorter than the third, fifth nearly as long as the other joints together.

Antennæ formed as in *Diplectrona,* with a short spine at the apex of each joint in the apical portion and a slight dilatation of the joint on its inner surface ; ocelli absent ; spurs 2.4.4; intermediate tibiæ and tarsi of the ♀ not dilated. Anterior wings with forks 1, 2, 3, 4, and 5 present, broad at the apex, which is obliquely truncate; subcosta and radius much thickened from the base to the cross-vein joining them; posterior wings very broad, lower margin nearly semicircular; forks 2, 3, and 5 present; no median cellule; subcosta elbowing downward nearly to meet the radius near the apex of the wing, so as to present the false appearance of a fork; cubitus somewhat pigmented.

Fig. 1.



*Diplectronella afra*, sp. n., ♂. Lateral filament.

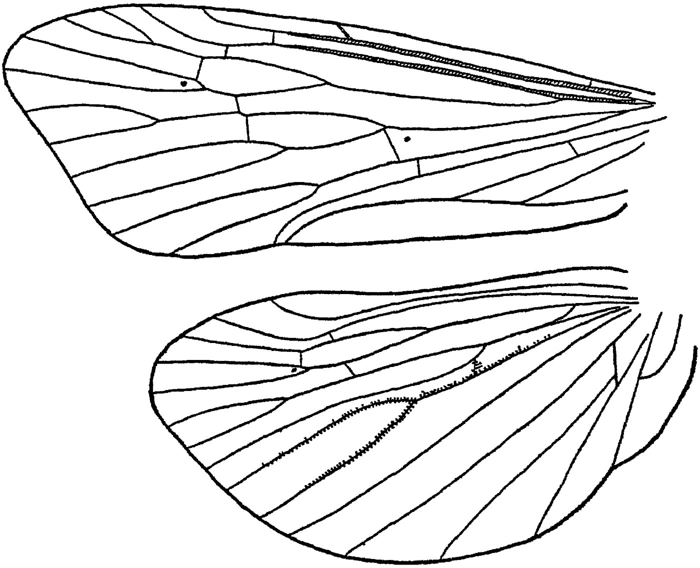
Male genitalia simply in construction; there is a pair of rather broad superior appendages, beneath which can be seen an upper penis-cover consisting of two plates divided to their base; no intermediate appendages; penis much dilated at the apex, on the upper surface of which is a cup-like depression holding four stylets; inferior appendages two-jointed, basal joint long and slender; terminal joint short. In both sexes there is a long filament on each side of the abdomen, arising from the base of the fourth segment, those of the male being the longer.

*Diplectronella taprobanes*, Hagen. (Figs. 2–5.)

Further description of the genitalia of this Ceylon species, made from an example cleared in KOH, is desirable in view of a very closely allied species having been found in India.

*Wings.*—Anterior : nervure joining the sector and upper branch of upper cubitus (medius) slightly in front of or in line with the nervure closing the median cellule.

Fig. 2.



*Diplectronella taprobanes*, Hagen, ♂. Wings.

*Genitalia* (♂).—Margin of last dorsal segment somewhat sinuate, the centre advanced to an obtuse angle ; the centre of the segment is raised above the sides to form a triangular platform with an acute apex coinciding with the obtuse angle mentioned above; from the side there is a small fold in the outer margin at the centre. Superior appendages from above short and wide, with outward-turned lower apical margins ; from the side the appendage seems roughly pentagonal. Upper penis-cover from above in the form of two plates, apices dilated and widely separate, extending beyond and above the superior appendages; from the side

Fig. 3.

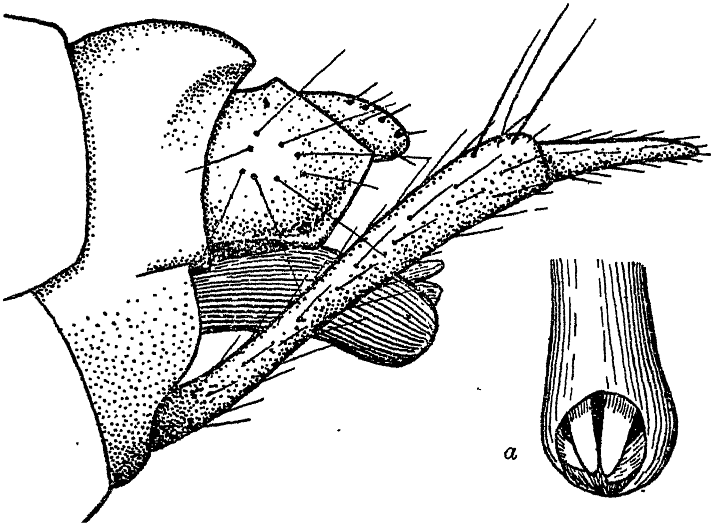
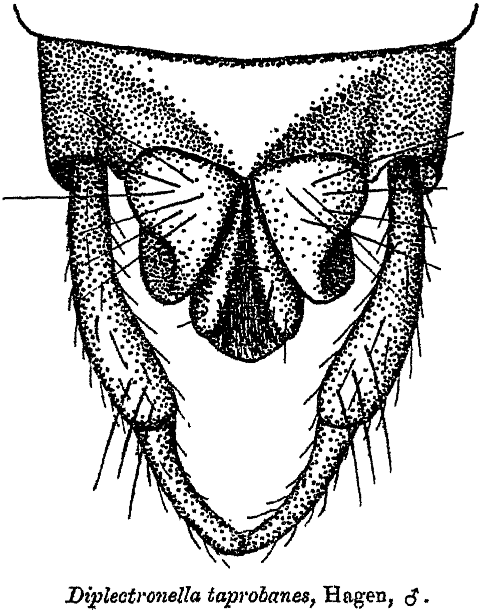


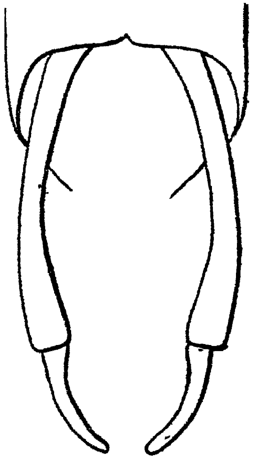
Fig. 4.



*Diplectronella taprobanes*, Hagen, ♂.
Fig. 3.—Genitalia from the side; *a*, penis from above.
Fig. 4.—Genitalia from above.

apices rounded. Penis short, apex dilated, with a cup-like depression on its upper surface containing four stylets, the inner pair nearly parallel, the outer pair converging towards each other beneath the inner. Inferior appendages with basal joint long and slender; terminal joint short and slender.

Fig. 5.



*Diplectronella taprobanes*, Hagen, ♂. Inferior appendages from beneath.

Additional material (♂ and ♀) from Madulsima, Ceylon (*T. B. Fletcher*), 22. v. 1908, 1910–134; and Green, Ceylon, 95–221; and examples ♂ and ♀, Peradeniya, Ceylon (*J. C. F. Fryer*), x. 1911 and ii. 1912, in the British Museum Collections.

### *Diplectronella indica*, sp. n. (Figs. 6–9.)

*Head.*—Reddish brown clothed with yellowish hairs; antennæ ochraceous, basal joint slightly darker than the remainder; palpi dark ochraceous.

*Wings.*—Anterior: clothed with reddish-brown hairs, faintly irrorated with golden spots, with some broader golden patches along the postcostal area; nervure joining the sector and upper branch of the upper cubitus (medius) considerably nearer the base than the nervure closing the median cell. (This character may be variable, as in the ♀ it is situated as in *taprobanes*.) Posterior: light brown, semitransparent.

Fig. 6.

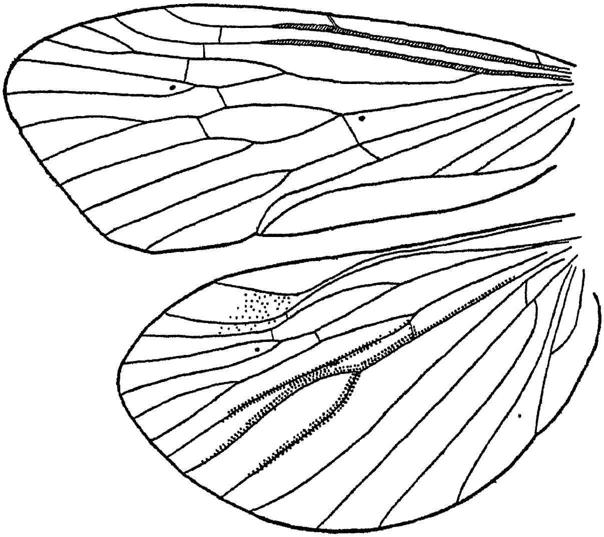
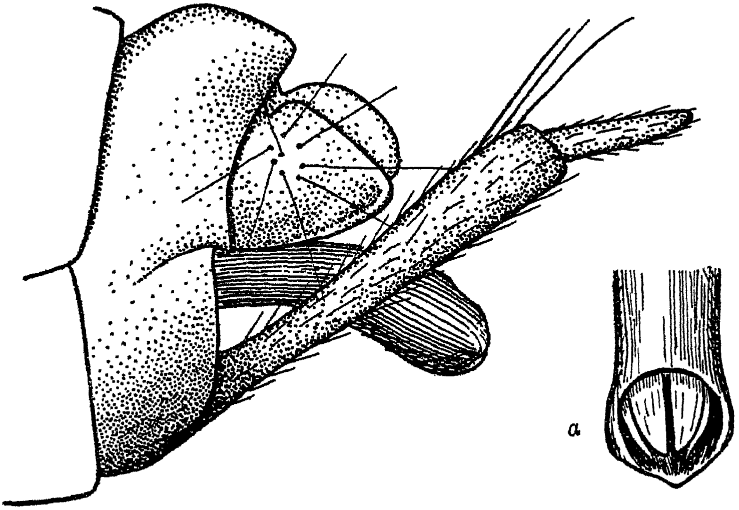


Fig. 7.



*Diplectronella indica*, sp. n., ♂.

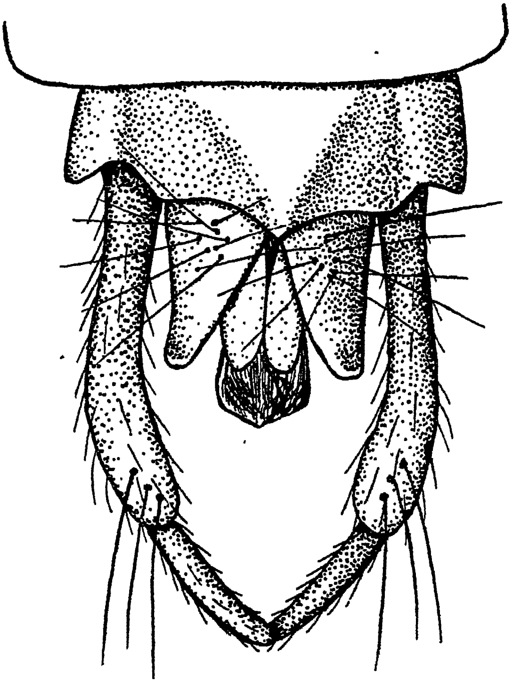
Fig. 6.—Wings.
Fig. 7.—Genitalia from the side; *a*, penis from above.

*Legs*.—Ochraceous.

*Abdomen*.—Very dark reddish brown.

*Genitalia* (♂).—Last dorsal segment with margin sinuate, centre advanced to an obtuse angle; the centre of the segment raised above the sides to form a triangular plate with a very acute apical angle which coincides with the angle mentioned above; from the side a small fold is seen at the centre of the outer margin. Superior appendages from the side, rather broad at the base, triangular, with subacute apical angles; from above rather long, tapering to rounded apices, diverging from each other, and without the outwardly turned apical margins seen in *taprobanes* and *afra*; upper penis-cover consists of a pair of plates lying parallel with each other, with narrow rounded apices, extending about the same length as the superior appendages; penis short, apex dilated, with a cup-like depression on its

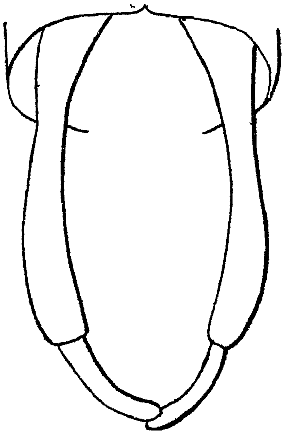
Fig. 8.



*Diplectronella indica*, sp. n., ♂. Genitalia from above.

upper surface containing four stylets, of which the inner pair are broad and the outer very narrow; inferior appendages with basal joints long, constricted at the centre; apical joints short and slender.

Fig. 9.



*Diplectronella indica*, sp. n., ♂. Inferior appendages from beneath.

Length of body (♂) 6 mm., length of anterior wing (♂) 7 mm.; length of body (♀) 6 mm., length of anterior wing (♀) 8·5 mm.

India: Belgaum, Bombay Territory, Watson Coll., Sept. 1896.

*Type* (♂), paratype (♀), in the British Museum Collection.

### *Diplectronella afra*, sp. n. (Figs. 10–13.)

General appearance similar to that of *indica*.

*Wings* of type aberrant. In both anterior and posterior wings of one side the discoidal cells are open; fork 1 in the anterior and fork 3 in the posterior wings figured seem abnormally narrow, in the pair not figured fork 1 of the anterior wing takes the form of an enclosed cell, and there is the merest trace of fork 3 in the posterior wing.

*Genitalia* (♂).—Margin of last dorsal segment sinuous, produced to a slight angle at the centre; from the side there is an angular projection towards the centre of the outer margin; superior appendages from above, rather widely divergent, broad at the base, narrowing towards the apices—lower margin turned slightly outward, so that there appears to be a

Fig. 10.

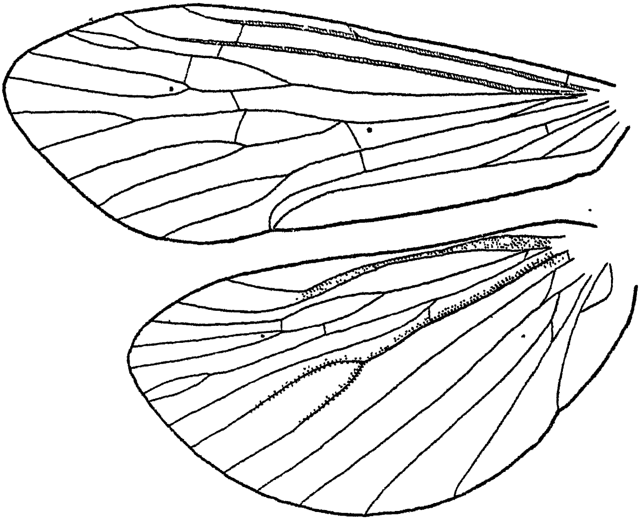
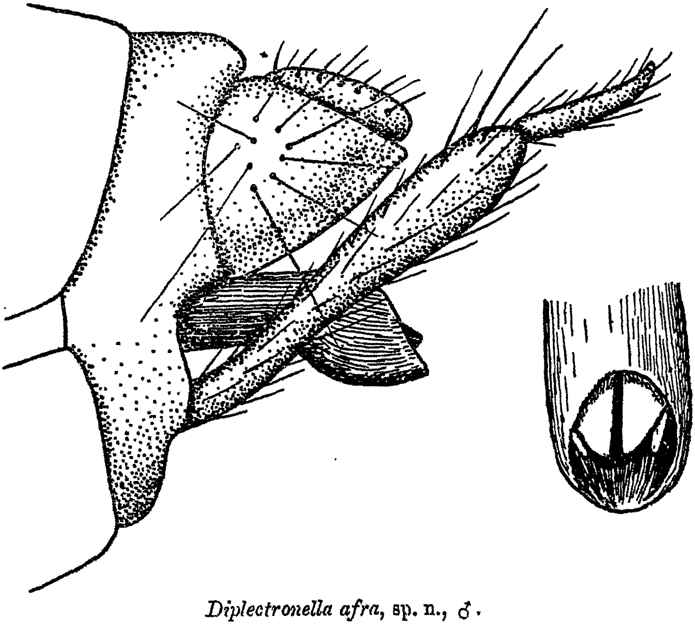


Fig. 11.



*Diplectronella afra*, sp. n., ♂.

Fig. 10.—Wings.
Fig. 11.—Genitalia from the side; *a*, penis from above.

Fig. 12.

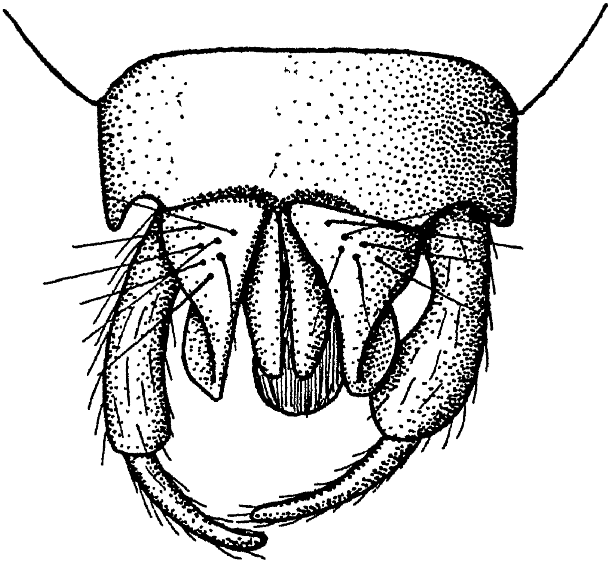
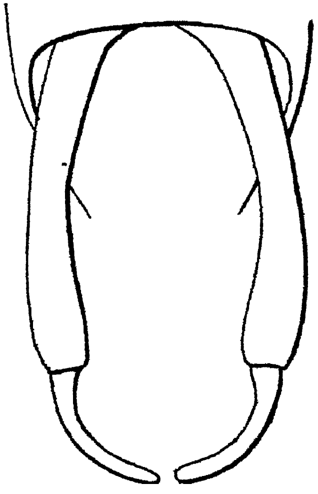


Fig. 13.



*Diplectronella afra*, sp. n., ♂.

Fig. 12.—Genitalia from above.
Fig. 13.—Inferior appendages from beneath.

small rounded shelf at the outer margin of each appendage towards the apex; the appendage from the side is very broad at the base, triangular, with a very acute apex; from above the upper penis-cover can be seen between the superior appendages as two finger-like plates parallel with each other and slightly raised above and rather shorter than the superior appendages; penis short and stout from the side, lower margin greatly dilated; at the apex, which from the side is obliquely truncate, there is a cup-like depression in which are four stylets, of which the two centre are broad and the outer narrow; inferior appendages with a long basal joint, from the side, dilated towards the apex; terminal joint short and slender.

Length of body (♂) 6 mm., length of anterior wing (♂) 8 mm.

♀.—Unknown.

Uganda: Kampala, 19. iii. 1927 (*G. L. R. Hancock*).

*Type* (♂) is a balsam preparation presented to the British Museum by the Imperial Institute of Entomology.

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## XXV.—*Notes on the Tachinid Genus* Chætonodexodes, *with One new Species*. By J. M. Aldrich, United States National Museum.

The genus *Chætonodexodes* was described by Townsend in 'Proceedings U.S. National Museum,' vol. li. 1916, p. 321. The genotype and sole species was *rafaeli*, new, described on the following page from a single male, locality San Rafael, Vera Cruz, Mexico. The type is in the United States National Museum.

The generic description is in the form of a comparison with *Œstrogastropsis*, Tns., known only from a female, and described in the same 'Proceedings,' vol. xlix. 1915, p. 424;

the latter description, however, is a comparison with *Œstrogaster*, Tns., published in the same 'Proceedings,' vol. xliii. 1912, p. 309. This condition makes it very difficult to ascertain the characters of *Chætonodexodes* without access to the type.

Having received a new species which is undoubtedly congeneric, I first note the generic characters from the type of *rafaeli* before describing the new form.

Hypopleural bristles and postscutellum present; eyes, parafacials, and arista bare; facial ridges bristly almost to level of arista; head nearly hemispherical in shape, the face very receding and mouth not prominent, so that in profile the eye covers the whole head except a narrow uniform margin all round the eye, the cheek being only 1/12 of the eye-height. Front about 1/6 of head-width, narrowing slightly to the level of antennæ, the median stripe almost twice as wide as one parafrontal. Palpi and proboscis small. Ocellars of good size, proclinate and divaricate; outer verticals about half as long as inner; three pairs of upper frontals reclinate, about six pairs convergent below these, lowest at middle of second antennal joint; two pairs of proclinate orbitals (male). Antennæ arising just below middle of front of head, third joint nearly three times the second, basal joints of arista short. Vibrissæ at oral margin.

Thoracic chætotaxy: acrostichal 2 anterior (one just before suture), the posterior spoiled by the pin (three in the new species); dorso-central 2, 3; humeral 2; posthumeral 1 (inner); presutural 2; notopleural 2; supra-alar 3 (only the middle one large); intra-alar 3; postalar 2; sternopleural, 1, 1; pteropleural 0; scutellum with 4 lateral pairs, of which the subapical are long and divaricate, and with a delicate upcurved pair of apicals, merely hairs.

Abdomen with median marginals, one pair each on first three segments; no discals on any segment, but the median pair on the fourth is subdiscal.

Wing with first posterior cell ending very slightly before apex (one-third as far as from tip of second vein); first vein bare, third with setules only at base; fourth concave outwardly beyond the bend, the hind cross-vein joining it at three-fifths of the distance from anterior to bend.

Claws and pulvilli small; front tibiæ with two bristles on outer hind side; middle with one on outer front side and one flexor, hind not ciliate.

The male type of *rafaeli* is a small, slender, dark fly with very long and narrow wings which are uniformly brown in colour; the new species, females only, is of ordinary form and not nearly so dark. It has a small but distinct piercer, which indicates that it is not very close to *Œstrogastropsis* (= *Calodexia*).

### *Chætonodexodes marshalli*, sp. n.

*Female.*—Agreeing with all the above characters, including chætotaxy, except for a few details. There are only two reclinate frontals; there is a small pteropleural; the cheek is 1/8 of the eye-height; the front is slightly more prominent at antennæ and less near vertex; the hind cross-vein is more erect, joining the fourth vein hardly beyond the middle between anterior cross-vein and bend; first posterior cell ending slightly nearer to apex.

Thorax black, subshining, but with delicate brownish pruinosity; a narrow transverse subsilvery cross-band just before the suture and a broad transverse spot of the same colour just in front of the scutellum, as wide as the latter and limited anteriorly by the prescutellar bristles.

Abdomen shining black, with very narrow silvery basal cross-band on second segment, a slightly wider subinterrupted one on third, and wider indefinite and faint spots on sides of base on the fourth. A distinct small piercer projecting forward below, visible in all three specimens, but not accompanied by any keel-like development of the venter nor with any stubby bristles along the middle line, as in many forms with piercer, for instance *Spathimeigenia*.

Legs black, pulvilli dark brown. Wings uniformly subhyaline; costal spine more distinct than in the male of *rafaeli*; third vein with about three setules at base.

Length 2·9 to 3·2 mm.

Described from three females from Trinidad, West Indies, which were received from Sir Guy A. K. Marshall, Director of the Imperial Institute of Entomology, London, in whose honour I name the species. The types were reared by F. W. Urich, and are labelled "Ex *Schematiza livida*." This is a Chrysomelid beetle, but I have been unable to find it listed so as to get the author's name.

The type and one paratype have been returned to Sir Guy Marshall, and the remaining paratype is deposited in the U.S. National Museum under type number 43531.

It is possible that this is the female of *rafaeli*, but the marked differences of form and colour seem to make it very unlikely.

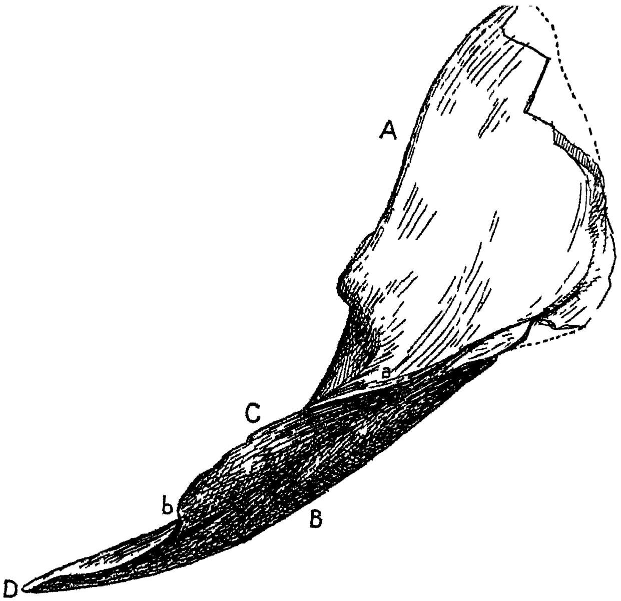
# XXVI.—*The Anterior-lateral Plate in* Titanichthys.

By Anatol Heintz, of the Palæontological Museum, Oslo.

(Published by permission of the Trustees of the British Museum.)

In 1893 E. W. Claypole published a paper, "On Three new Species of *Dinichthys*" ('American Geologist,' xii. p. 278, pl. xii.), in which he described and figured the "left premaxillary" of a new form, *Dinichthys clarki*. This specimen had a very remarkable shape, and Claypole's attempt to homologize it with the "premaxillary" in other forms of *Dinichthys* was unsatisfactory.

Fig. 1.



*Titanichthys* sp.

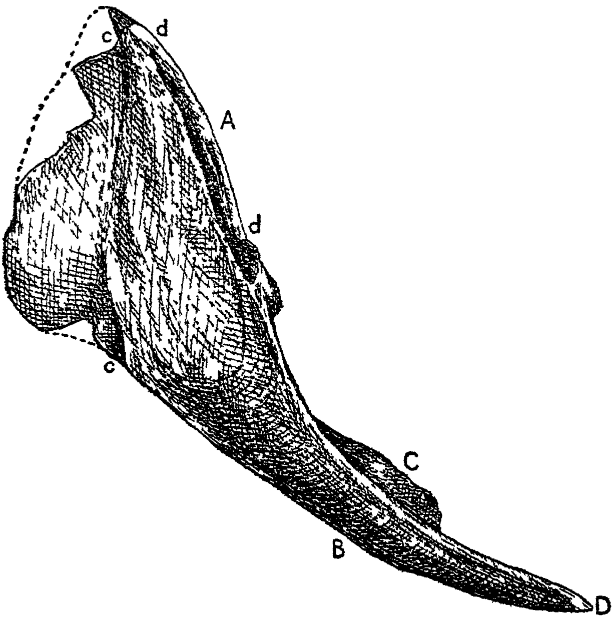
Anterior-lateral plate, outer view. ¼ nat. size.
A=upper part. B=process. C=ridge. D=point of process.

The original, with the greater part of Claypole's collection, is now in the British Museum (Natural History), where, with the kind permission of the Keeper, I was privileged to study it. A comparison of Claypole's drawing with the original shows that the former is extremely inaccurate, so much so that it is difficult to recognize in it the different parts of the bone (compare Claypole's figure with figs. 1 & 2).

The bone in question is represented in the British Museum by a pair (right and left) certainly belonging to the same individual (B.M., P. 9337).

Seen from the outer side (fig. 1), the upper, nearly triangular part of the bone is flat, smooth, and relatively thin (fig. 1, A). It narrows in the lower half, gradually passing into a long, slightly-curved, thick and rounded process (fig. 1, B), sharply pointed at the end (fig. 1, D). This process Claypole regarded as the "tooth." A comparatively thin but prominent ridge (fig. 1, C) arises gradually as the bone narrows (fig. 1, *a*) and runs downwards along the middle of the process, ending abruptly some distance from the extremity (fig. 1, *b*).

Fig. 2.



*Titanichthys* sp.

Anterior-lateral plate, inner view. ¼ nat. size.
*c–c*=limit between upper and lower parts. *d–d*=groove on the upper margin of part A. Remainder as in fig. 1.

The inner side of the bone is more uniform. The broader upper part (fig. 2, A) passes without interruption into the inferior process (fig. 2, B). On the upper thickened border of part A a deep and long groove is developed, where, apparently, another plate articulated (fig. 2, *d–d*). The posterior part of A is, on the contrary, quite thin and clearly divided off from the upper (fig. 2, *c–c*), and, without doubt, this thin part overlapped another plate. It is obvious that this plate never belonged to the jaw apparatus of an Arthrodire, but, judging by its form, it might be either the suborbital or the anterior-lateral.

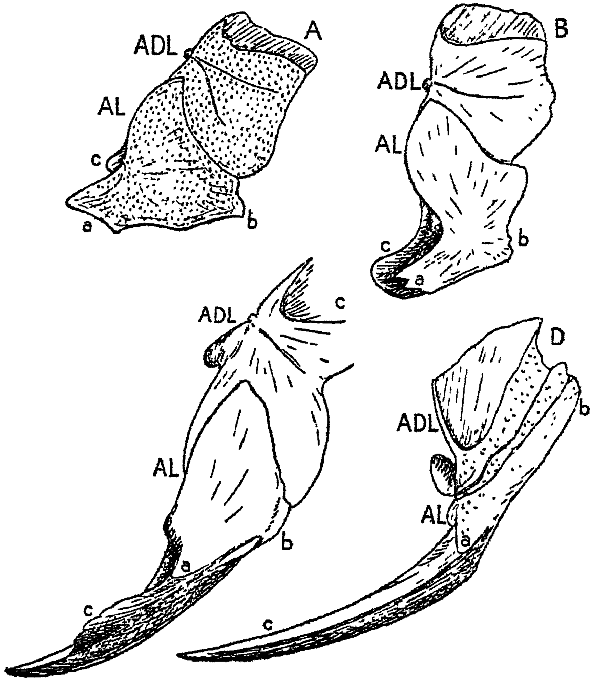
However, for a suborbital it is too massive, and shows no trace of the sensory canals that are always developed on this plate. Hence it must be the anterior-lateral. This plate, which binds the ventral and dorsal parts of the body-armour in the Arthrodira, has always certain characteristic features, although variable in form. Our specimen cannot belong to a *Dinichthys*, as the anterior-lateral in that genus has an entirely different shape (fig. 3, B). It is, however, reminiscent of the anterior-lateral in *Stenognathus* and in *Heterostius* (fig. 3, D).

J. S. Newberry ('Palæozoic Fishes of North America,' pl. iii. fig. 3, 1889), figured as a fragment of the "Coracoid?" of *Titanichthys clarki*, Newb., a specimen, which recalls our plate. C. R. Eastman's reconstruction ('Devonian Fishes of Iowa,' p. 204, 1908) of the head- and body-shields of *Titanichthys* shows an anterior-lateral very like our plate, the only difference being that the flat upper part (A) of the bone is broader and more quadrangular in shape. Unfortunately, Eastman did not give a detailed description or more complete drawing of the anterior-lateral in this genus, and thus in reality we have nothing with which to compare our specimens. However, if one looks at the fragments of anterior-dorso-lateral of *Titanichthys* (which is represented by many good specimens in the British Museum, as, for instance, P. 9325) we can see that our plate fits so well on to them that it leaves little doubt that it is the anterior-lateral of this genus. Into the deep anterior cleft of the upper part (fig. 2, *d–d*) fits the lower front part of the anterior-dorso-lateral (fig. 3, C), and the uneven inner surface was covered by the lower part of anterior-dorso-lateral. This is of great interest, as the shape and size of the anterior-lateral of *Titanichthys* have not hitherto been described, and especially as this pair of bones is excellently preserved.

It is interesting to try to follow the development and specialization of the anterior-lateral in different Arthrodires.

Beginning with *Coccosteus*, a more or less primitive form, we notice that this bone is represented by a large plate, broad in the upper part and narrow below. On the front margin is developed a small process (fig. 3, A, *c*) forming the point of a thickened ridge running downwards from the top. The anterior-lateral was in contact with five other plates of the body-armour: the front part of the upper margin overlapped the anterior-dorso-lateral, and the hinder part the posterior-lateral; from process *c* and downwards to the lower point it was in contact with the interior-lateral, and the basal part (*a*) with the spinal; lastly, the hinder margin

Fig. 3.



The anterior-lateral and anterior-dorso-lateral plates in different Arthrodira.

A = *Coccosteus decipiens*, Ag. ⅓ nat. size. B = *Dinichthys* sp. $\frac{1}{18}$ nat. size. C = *Titanichthys* sp. $\frac{1}{8}$ nat. size. D = *Heterostius* sp. ⅛ nat. size. *a* = outer part of anterior-lateral. *c* = inner part of anterior-lateral (wing). *b* = posterior corner of anterior-lateral.

(*a–b*) probably made contact with the anterior-ventro-lateral, as was the case in *Acanthaspis* and *Pholidosteus*.

In *Dinichthys* we find another type (fig. 3, B). The process (*c*) is here developed into a long, strong "wing," and the whole plate was fork-like, the two parts of the "fork" (*c*) and (*a*) being connected below. The anterior-lateral in *Dinichthys* touched only four plates: along the upper margin, the anterior-dorso-lateral and posterior-lateral; with the "wing" (*c*) the interior-lateral, and with the lower part (*a*) the spinal. The direct connection with the anterior-ventro-lateral is lost, as the point (*b*), which in *Coccosteus* formed the contact, is here relatively high up.

*Titanichthys* shows a further stage of development. The "wing" (*c*), which in *Coccosteus* was weakly developed, here forms the main portion of the lower part of the anterior-lateral, the outer part (*a*) being very reduced. The ridge (fig. 1, C) represents the only remains of the connection between the two parts of the "fork" in *Dinichthys*.

Unfortunately we know very little about the ventral shield, the interior-lateral and the spinal in *Titanichthys*. As in *Stenognathus*, which in many characters is closely related to that genus, the ventral plates are normally developed, it is probable that this is also the case in *Titanichthys*. Of the connection between the dorsal and ventral shields nothing is as yet known.

The next stage in the development of this bone is shown by *Heterostius*. As I pointed out in my recent paper (Sitz. ber. Naturf. Gesell. Univ. Tartu (Dorpat), xxxvi. p. 172, 1930), the anterior-lateral in this form is almost reduced to the "wing" (*c*). The part (*a*) is very small, and only a ridge shows its existence. The ventral shield is here greatly reduced, and only represented by one plate, the anterior-median-ventral. Nothing is known of the presence of an interior-lateral or a spinal.

This series, which we might have started with *Acanthaspis*, and supplemented with some intermediate forms, such as *Pholidosteus*, *Stenognathus*, *Selenosteus*, and *Homostius*, shows clearly the variations in the form of the same bone and the changes in its function. Originally a superficial bone (in *Acanthaspis*, *Pholidosteus*, *Coccosteus*, and others), the inner part of the anterior-lateral become more and more strongly developed and the superficial correspondingly reduced, and as a result the bone lost contact with some of its neighbouring plates, which became partly reduced (*e.g.*, the spinal and interior-lateral), and came in contact with other bones, (*e.g.*, anterior-median-ventral in *Heterostius*).

## XXVII.—*The Bee-genus* Crocisaspidia.

### By T. D. A. Cockerell.

In 1899 Ashmead briefly indicated the characters of a genus *Crocisaspidia*, which he quite erroneously placed in the Nomadidæ. He also described the postscutellum as the scutellum, and said that the type-species had white marks on the abdomen, whereas they are blue. Nevertheless, I later had an opportunity to study the unique specimen forming the basis of the genus, and found that it was a close ally of *Nomia*—as I then considered (1909), no more than a subgenus. It was further evident that this subgenus, or genus, included also *N. scutellaris*, Saussure, from Madagascar, *N. amabilis*, Ckll., from Benguella, and the African *N. maculata* and *N. nigripes* of Friese. I indicated the characters of these in Proc. U.S. Nat. Mus. xxxvi. pp. 418–419. In the meanwhile (1900), W. F. Kirby had described a supposed parasitic bee, *Crocisa forbesii*, from Sokotra, but Kohl (1906) showed that it was a *Nomia* of the group of *N. scutellaris*—that is, a *Crocisaspidia*. Further investigation brought out the fact that as early as 1871 Walker had described *N. vespoides* and *N. zonaria* from the vicinity of the Red Sea, both of them *Crocisaspidia*. Bingham, in 1903, described *N. crocisæformis* from Abyssinia; I have examined his type. Smith, in 1875, published *N. lamellata*, the type (female) from Gambia, the male from Egypt. It appears that the Egyptian specimen is Walker's *N. zonaria*, but the insect from Gambia may prove separable (see Ann. & Mag. Nat. Hist., June 1910). In 1910 *N. muscatensis*, Ckll., was described from Muscat, Arabia. It has been found also at Aden, and goes eastward as far as India. It is now to be added to the fauna of Africa, as a male, received from the Imperial Institute of Entomology, was taken by W. E. Giffard at Bouga, Sudan, on amioga, 10. xii. 22. *N. bahadur*, Nurse, of which I have an authentic specimen from Deesa, is another Asiatic form. It was sent to me by Col. Nurse with a label indicating that it was a synonym of *N. maculata* (Friese), but this is not at all the case. The abdominal markings are light green instead of blue, and there is no light tomentum in front of scutellum or on postscutellar process.

There are still other names which have been proposed for African species, namely, *N. pretiosa*, Friese, 1930 (I have an authentic specimen from Nÿasaland), *N. fasciata* (Friese, 1909), from the Transvaal, and *N. pseudoscutellaris*, Strand, 1914, from the then German East Africa. Ashmead's species, the type of *Crocisaspidia*, was called *C. chandleri*, but the name was an obvious slip of the pen for *C. chanleri*. Thus we have in all sixteen names for species or forms of *Crocisaspidia*. It has been suggested that Smith's *N. lamellata* may be composite. We may similarly suspect *N. pretiosa*, Friese, said to range all the way from the Gold Coast to Bulawayo. It is not Smith's *lamellata*, being considerably smaller, with the abdominal bands strongly greenish, and the process of axillæ bright red. My specimen of *N. lamellata* is from the Gold Coast (Yapi, 1916, *J. J. Simpson*). I now think that *Crocisaspidia* is best accepted as a genus, and the species fall in groups as follows :—

(1) Abdomen with entire tegumentary bands, usually yellowish or fulvous. Africa to N.E. India.

*C. scutellaris* (Sauss.).
*C. fasciata* (Friese).
*C. pretiosa* (Friese).
*C. postscutellaris* (Strand).
*C. zonaria* (Walker).
*C. lamellata* (Smith).
*C. muscatensis* (Ckll.).
*C. vespoides* (Walker).
*C. forbesi* (Kirby).

(2) Abdomen with the bands broadly interrupted, so that there is a row of blue markings on each side. Africa to N.E. India.

*C. amabilis* (Ckll.).
*C. bahadur* (Nurse).
*C. maculata* (Friese).
*C. chanleri*, Ashmead.
*C. nigripes* (Friese).

(3) Abdomen with lateral quadrate white spots, faintly tinged with green; anterior wings dark fuscous. Abyssinia.

*C. crocisæformis* (Bingham).

A fine new species, most nearly allied to *C. crocisæformis*, but with the lateral marks on abdomen band-like, not quadrate, and the antennæ differently coloured, is now to be added to the genus :—

### *Crocisaspidia albopicta*, sp. n.

♂.—Length about 13 mm., anterior wing 10.

Robust, black, the tegumentary markings on abdomen pure white; eyes dark brown; front with a delicate keel, extending halfway down clypeus; face and front densely covered with cream-coloured hair; antennæ only moderately long, black, with the third and fourth joints bright terra-cotta-red beneath; tongue long and very slender; mandibles black, with a rufous subapical spot; cheeks behind eyes with a band of appressed silver-white hair, and behind this a beard of outstanding white hair; mesothorax and scutellum entirely dull, with a granular surface; at sides of scutellum are two lobes, a flattened, scale-like, brownish one, set on edge, pertaining to the axilla, and a closely adjacent much thicker black one, pertaining to the scutellum ; postscutellar extension bifid as usual, black, not covered by pubescence, nor is there an evident band of pubescence before scutellum ; area of metathorax weakly sculptured, but fluted at sides ; pleura and sides of metathorax with abundant long white hair ; vertex and anterior half of mesothorax, extending to tubercles, with pale yellowish hair. but thorax above also with thin black hair ; tegulæ large, obtusely pointed behind, black with brownish margins. Wings dusky hyaline, clear at base, but apical margin broadly darkened ; basal nervure arched at lower end, meeting nervulus ; stigma rather small, dark reddish ; second cubital cell about square, receiving recurrent nervure not far from end ; third cubital very broad above ; legs black, with white hair, ferruginous on inner side of tarsi (hind basitarsi with a red fringe in front) ; spurs deep red, hind spurs abruptly bent at end ; hind femora strongly swollen, subclavate ; hind tibiæ very thick, trigonal, with a large red process at inner apical corner ; hind basitarsi very large ; abdomen dull, with white hair at base and sides, but black hair on discs of tergites, the extreme apex dark red ; tergites 1 to 5 with pure white tegumentary bands ; on first so widely interrupted that less than lateral thirds are present, the ends of the lateral portions mesad red ; on second and third with about the median third missing, on fourth with little more than a fifth missing, on fifth entire ; venter with a large triangular patch of appressed yellowish hair.

Kenya Colony : Trans-Nzoia, May 3, 1919 (*T. J. Anderson*). Sent by Imperial Institute of Entomology.

The fusion of the axillæ with the scutellum is so complete that I am not sure that the two adjacent laminæ pertain to the two different elements as described. In *C. pretiosa* I see here a single structure, deep red, presenting two keels with a trough between. The nearest allies of *Crocisaspidia* appear to be such species as *Nomia speciosa*, Friese, with long slender tongue, and broad, entire, orange, tegumentary bands on abdomen. The *Crocisaspidia* most similar to this is *C. lamellata* (Smith).

P.S.—I find that *Nomia superba*, Friese, 1930, is also a *Crocisaspidia*. It comes from the Cameroons, and is large (both sexes 15–16 mm. long), with entire yellow bands on abdomen. From the description, it must be at least extremely close to *C. lamellata* (Smith).

## BIBLIOGRAPHICAL NOTICE.

*A History of Fishes.* By J. R. NORMAN. London: E. Benn, Ltd., 1931. Pp. xv + 463, 9 plates, and 147 text-figures. Price 28*s*.

MR. NORMAN has been for ten years a member of the scientific staff of the Natural History Museum, and during that time he has been in charge of the collection of fishes. He has now written a book, which he hopes is of sufficient interest to provide general reading, not only for the student of fishes and the angler, but for all those who take an intelligent interest in wild life. Classification, the part of his subject with which a museum worker is generally most familiar, is reduced to a minimum—indeed, the chapter on this subject is so short as to have little value, even as an index to the others. The book consists mainly of a series of chapters on form and locomotion, fins, teeth and food, coloration, breeding, etc., etc., in writing which the author has drawn on his knowledge of the vast literature of the subject.

As compared with the Cambridge Natural History, which covers a good deal of the same ground, Mr. Norman is able, by omitting the systematic part, to treat certain subjects more fully, and to include chapters on geographical distribution and on fisheries; the results of the researches of an additional 25 years are also available. The book, therefore, includes a good deal that has not before been got together in one volume, and it may be described as a well-written, up-to-date, and informative treatise that should serve admirably the purpose for which it was written, at least so far as the general reader and the angler are concerned.

For the student we think the book would have been of more value if more references had been given to enable him to consult the original authorities. In stating "it would, of course, be of little value to include a bibliography of such works here," Mr. Norman seems to us to be neglecting the ichthyologist and the student of fishes. Also, although this statement and others in the preface may be considered as an acknowledgment that the book is mainly a compilation, there are certain portions—for example, the greater part of the chapter on geographical distribution—that are taken so directly from the writings of others that specific mention of the fact might have been made.

The figures in the text are said to be, with few exceptions, new; but many of them have a familiar appearance. Here we have a problem: Does copying or re-drawing a figure already published furnish a new figure? The reviewer would have attributed, for example, figure 98 to Regan, figure 100 to the Cambridge Natural History, etc.

C. T. R.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 45. SEPTEMBER 1931.

# XXVIII.—*Some interesting West African Fishes, with Descriptions of a new Genus and Two new Species.* By A. FRASER-BRUNNER.

Two collections of fishes made during 1929–30 by Capt. Hugh Fraser in West African waters at my request have yielded a number of interesting specimens, the more remarkable of which are dealt with below. Part of the material was obtained in fresh water, part inshore, but the major portion was taken in deep water with a net specially made for the purpose. It is intended that a note on this net shall be published elsewhere.

I would like to place on record my gratitude to Capt. Hugh Fraser for his trouble in constructing the net and collecting these valuable specimens for me. My thanks are also due to Mr. J. R. Norman and Miss Ethelwynn Trewavas for their kind assistance in determining several of the species. The types of the new species have been deposited in the British Museum (Natural History).

Of the freshwater forms the only one worth mentioning is a specimen of *Kneria cameronensis*, Boulenger (75 mm.*), from the Ogowai River, near Saburo.

The shore-fishes include an example of *Centropomus ensiferus*, Poey (70 mm.), from the mouth of the Cross River. The occurrence of a member of this typically American genus in African waters is of considerable interest. So far as I can ascertain, no other has been recorded from this locality, and it can only be assumed that it has crossed the Atlantic, possibly carried by currents during its early stages. It differs in no respect from South American examples of the same size.

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* All specimens are measured to the base of caudal fin.

Of some two hundred oceanic fishes, mostly of small size, the following are worthy of mention:—

### *Vinciguerria sanzoi*, Jespersen & Tåning, 1919.

Lat. 4° 44′ S., long. 6° 18′ E., 250 fath.; 3 specimens, 15–20 mm.

### *Diplophos tænia*, Günther, 1873.

Lat. 8° 15′ S., long. 7° 30′ E., 250–400 fath.; 1 specimen, 35 mm.

### *Polyipnus laternatus*, Garman, 1899.

Lat. 8° 15′ S., long. 7° 30′ E., 250–400 fath.; 3 specimens, 20–25 mm.

Very young examples of *P. spinosus*, Günther, 1877, closely resemble those of *P. laternatus*, even to the median dark bar and the absence of a hook-like spine on the post-temporal, but they differ in the absence of the three elevated pre-anal photophores and the possession of two elongate vertical supra-abdominal organs. In early post-larval specimens there is no argenteum to the skin; in examples of 10–15 mm. it covers the head and opercles, and gradually extends back with the growth of the fish to cover the whole body in adults.

### *Diplolychnus mononema*, Regan & Trewavas, 1929.

Lat. 4° 40′ S., long. 6° 18′ E., 250–450 fath.; 1 specimen, 73 mm.

This specimen, which agrees well with the original description, had the post-ocular luminous body bright red in life.

### *Odontostomias micropogon*, Norman, 1930. (Fig. 1.)

Lat. 11° 5′ S., long. 3° 20′ E.; 1 specimen, 40 mm.

This young specimen differs from the adult in the form of the body and the bulb of the barbel, as may be seen by comparing the accompanying drawing with that in Norman's paper *.

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* 'Discovery' Reports, vol. ii. 1930, p. 309, fig. 18.

*Eustomias bibulbosus*, Regan & Trewavas, 1929.

Lat. 5° 18′ S., long. 7° 20′ E. ; 1 specimen, 54 mm. The barbel of this specimen is missing.

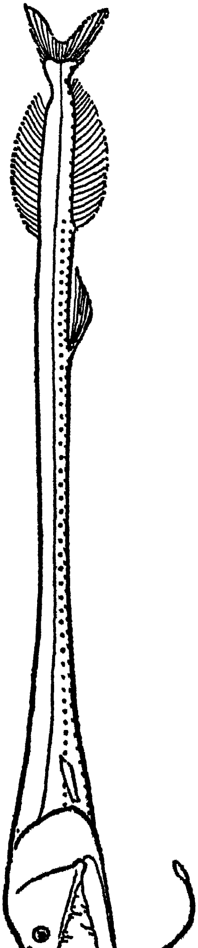

Fig. 1.

*Odontostomias micropogon*, Norman, × about 3.

*Bathylagus argyrogaster*, Norman, 1930.

Lat. 4° 44′ S., long. 6° 18′ E., 250–400 fath.; 2 specimens, 25 mm.

### LUCIOSUDIS, gen. nov. (SUDIDÆ.)

Body moderately elongate, covered with scales; tail short, its length (measured from origin of anal to base of caudal) less than $\frac{1}{3}$ that of fish. Head comparatively large, compressed; snout depressed, much longer than eye, which is large, elliptical, its horizontal diameter longer than the vertical, which equals the interorbital width. Mouth not extending beyond orbit; premaxillaries completely toothed anteriorly, without an edentulous notch at their symphysis; palate toothless. Dorsal fin a little nearer base of caudal than end of snout; anal long, with twice as many rays as dorsal; pectorals not low; pelvics placed well forward, about midway between gill-opening and origin of dorsal; paired fins and caudal moderately large.

The affinities of this genus with *Sudis* and *Chlorophthalmus* may be shown by the following key:—

I. Eyes elliptical; paired fins well developed, the pectorals high, the pelvics anterior; dorsal above pelvics; anal short, etc. ............ *Chlorophthalmus*.
II. Eyes elliptical; paired fins well developed, the pectorals high, the pelvics anterior; dorsal well behind pelvics; anal long, etc. ......... *Luciosudis*.
III. Eyes circular; paired fins very small, the pectorals low, the pelvics posterior; dorsal above pelvics; anal long, etc. ............ *Sudis*.

By the courtesy of Mr. J. R. Norman I have examined several species of Sudidæ in the British Museum, and note that adult characters, such as the position of the pelvics, emargination of the upper jaw, and structure of the eye, are already established in specimens as small as 20 mm. The present example is 50 mm. long (without caudal), is well developed, and may be taken as fairly representative of the adult.

Considered in relation to Parr's review of the Sudidæ (1928)*, the genus does not seem to belong to any of the subfamilies there defined, but I regard it as a Paralepid retaining certain primitive characters of the Chlorophthalminæ.

### *Luciosudis normani*, sp. n. (Fig. 2.)

Lat. 11° 5′ S., long. 3° 20′ E.; 1 specimen, 50 mm.

Depth of body $14\frac{1}{2}$ in length, length of head $3\frac{1}{3}$. Length of tail (measured from origin of anal to base of caudal) $3\frac{5}{8}$ in that of fish. Horizontal diameter of eye $1\frac{3}{4}$ in length of

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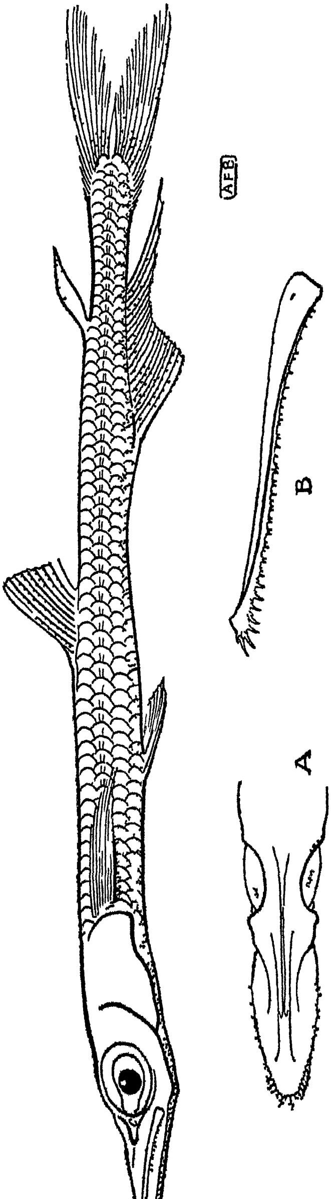
* Bull. Bingham Ocean Coll. vol. iii. (3) p. 15.

Fig 2



*Luciosudis normani*, sp n, holotype, × 3

A Dorsal view of head, × 4½ B Upper jaw, showing dentition, × 6 snout, 4½ in head. Maxillary slightly expanded distally, extending to a little beyond anterior margin of eye, lower jaw strongly projecting. Præmaxillaries with about 6 canines anteriorly, directed forwards to meet the very slightly raised symphysis of the lower jaw; lateral teeth arranged in irregular groups of one, two, or three, becoming larger anteriorly and grading into the canines, which have clusters of smaller teeth at their bases; teeth of lower jaw all small, in two irregular series. Dorsal 10; its origin a little nearer anterior margin of eye than base of caudal. Adipose fin above posterior third of anal. Anal 20, the posterior rays as long as the anterior. Pectorals 15, nearly reaching pelvics, base close to lateral line. Pelvics 10, in advance of dorsal, origin about equidistant from hind margin of operculum and origin of dorsal. About 60 scales in a longitudinal series, those of the lateral line not noticeably larger than the rest. Blackish, the vertical fins speckled between the rays.

Described from a single specimen, 50 mm. long, holotype of the species. Named after Mr. J. R. Norman, in appreciation of his many kindnesses towards the author.

Of the Myctophidæ many species are represented, the more notable of which are :—

### *Myctophum rissoi*, Cocco, 1829.

Lat. 7° 5′ S., long. 5° 20′ E., 300–400 fath.; 1 specimen, 65 mm.

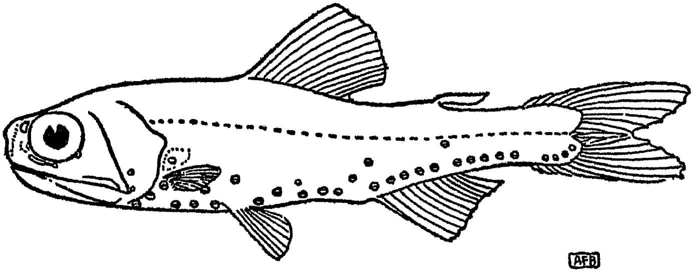
### *Diaphus fulgens*, Brauer, 1904. (Fig. 3.)

Lat. 3° 18′ S., long. 5° 17′ E., 250 fath.; 1 specimen, 43 mm.

This example, apparently larger than any so far recorded, may be described as follows :—

Depth of body 4 in length, length of head 3⅔. Snout much shorter than eye, diameter of which is 2½ in length of head and greater than the interorbital width. Maxillary not expanded posteriorly, extending well behind eye. About 15 gill-rakers on lower part of anterior arch. Dorsal 12; origin directly above root of pelvic. Anal 12; origin a little behind dorsal. Pectoral about ⅓ length of head. Pelvic 8. About 37 scales in a longitudinal series. Dorso-nasal luminous organ small, round, placed well above the nostril. No ventro-nasal organ. A small, narrow, suborbital organ along lower margin of eye, placed anterior to its centre; at its hinder end a minute round photophore connected with it by black tissue. Postorbital organ small, lower than pupil of eye. A large luminous scale probably present at PLO, which is nearer to pectoral fin than to lateral line. 2 PVO, well separated, the upper at pectoral base, the lower more anteriorly placed. 5 PO, the fourth elevated. Distance from lateral line to VLO twice that from VLO to pelvic. 5 VO, the second and third elevated successively, the third small and above the fourth. 3 SAO, forming a straight line slanting backwards. AO 5+5 all nearly level. Pol close to lateral line. 4 Prc, evenly spaced, forming an upward curve, the fourth some distance below the lateral line.

Fig. 3.



*Diaphus fulgens*, Brauer, × nearly 2.

The small posterior suborbital organ and the postorbital were not observed by Brauer, but, according to Tåning (*fide* Norman, 1930), the former at least is present in the types.

This specimen differs from those of Brauer in that the first AO is not elevated, and the PLO, PVO, and Prc$^4$ are placed low as in *D. taaningi*, a species with which this may prove to be identical.

### *Diaphus taaningi*, Norman, 1930.

Lat. 3° 18′ S., long. 5° 17′ E., 250 fath.; 1 specimen, 30 mm.

Corresponds exactly with the type except that the suborbital organ is very little broader than in *D. fulgens*. No posterior suborbital or postorbital organs. Mr. Tåning has already stated that the males of *Diaphus* may possess a larger suborbital organ than the females, and it is possible that *D. taaningi* is the male of *D. fulgens*.

### *Diaphus splendidus*, Brauer, 1904.

Lat. 5° 18′ S., long. 7° 20′ E.; 1 specimen, 33 mm.

### *Diaphus metopoclampus*, Cocco, 1829.

Lat. 11° 5′ S., long. 3° 20′ E., 200 fath.; 1 specimen, 33 mm.

### *Lampanyctus ater*, Tåning, 1928.

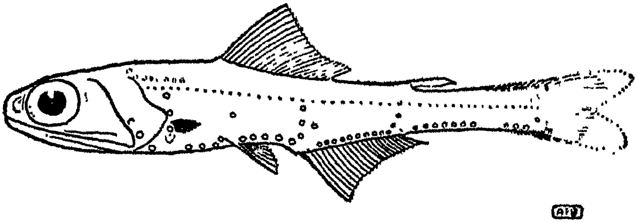
Lat. 5° 18′ S., long. 7° 49′ E., 200 fath.; 1 specimen, 30 mm.

### *Lampanyctus fraseri*, sp. n. (Fig. 4.)

Lat. 3° 18′ S., long. 5° 17′ E.; 1 specimen, 63 mm.

Depth of body $5\frac{2}{3}$ in the length, length of head $3\frac{1}{4}$. Snout $\frac{1}{2}$ diameter of eye, which is $2\frac{3}{4}$ in length of head and equals the interorbital width. Dorsal 20; origin immediately above root of pelvic. Anal 20; origin below posterior third of dorsal. Pectoral 13. Pelvics 8. 46 scales on lateral line. PLO much nearer to lateral line than to pectoral fin. 2 PVO, well separated, the lower opposite base of pectoral, the upper well above it, the two forming a vertical line with the PLO. 5 PO, all well separated, the distance between the first and second being nearly twice that between any of the remainder; the fifth is a little elevated. VLO equidistant from lateral line and pelvic fin. 5 VO, in a straight line. 3 SAO, forming an almost vertical straight line, the first close to and a little above last VO. AO in two groups, well separated; anterior 11, the first elevated to level of SAO 2, the last raised to form an almost straight line with AO 10 and the single Pol, which is not quite so close to the lateral line as PLO; 7 posterior AO, in a straight line. Prc, 3+1, the fourth widely separated and elevated, equidistant from lateral line and ventral profile.

Fig. 4.



*Lampanyctus fraseri*, sp. n., holotype, × about $1\frac{1}{4}$.

Luminous scales: a series above the operculum, one scale below PVO, one between SAO and AO 1, one in front of AO post., one on upper lobe of caudal peduncle, and several at base of the rudimentary rays of caudal, of which there are 12.

Described from single specimen, 63 mm. long, holotype of the species; named for Capt. Hugh Fraser, its discoverer.

This species appears to be related to both *L. braueri* and *L. nicholsi*, but is distinguished at once by the arrangement of the PVO photophores. Mr. Tåning has kindly compared my specimen with the type of *L. braueri*, and notes that it differs also in the situation of SAO and some of the luminous scales; he also observes that the anterior caudal rays are formed as in the *L. elongatus* group. From *L. nicholsi* it differs in the number of Prc and PO.

### *Caristius macropus* (Bellotti, 1903).

Lat. 8° 15′ S., long. 7° 30′ E., 200 fath.; 1 specimen, 30 mm.

This specimen agrees with the description given by Norman, except for the following differences in the proportions, due to age:—Head 2 in length, depth $1\frac{1}{2}$. Diameter of eye $2\frac{1}{2}$ in length of head.

### *Rhectogramma sherborni*, Norman, 1930.

Lat. 11° 5′ S., long. 3° 20′ E., 250–400 fath.; 1 specimen, 43 mm.

Agrees perfectly with type except for the lower opercular spine, which is longer in this very much younger specimen.

### *Stromateus microchirus* (Cuv. & Val. 1833).

Lat. 8° 15′ S., long. 7° 30′ E., 200 fath.; 1 specimen, 48 mm.

This young specimen cannot be identified with certainty, but approaches most nearly to *S. microchirus*.

Depth $1\frac{3}{4}$ in length, head $2\frac{3}{4}$; eye 3 in head.

## XXIX.—*Neotropical* Tingitidæ (*Hemiptera*).

By Professor Carl J. Drake, Ames, Iowa, U.S.A.

[Plate V.]

Mr. W. E. China, of the British Museum, London, has kindly submitted to me for study a small collection of South American Tingitidæ. This paper is based upon this collection and several specimens in my private collection.

### *Eurypharsa nobilis*, Guérin.

Santarem, Brazil, one male and two females.

The genus *Eurypharsa*, Stål, contains five described species, namely, *E. championi*, Bergroth, *E. fenestrata*, Champion, *E. phyllophila*, Drake, *E. quadrifenestrata*, Berg., and *E. nobilis*, Guér. *Eurypharsa* (*Tingis*) *circumdata*, Blanchard, is a synonym of *E. nobilis*.

### *Leptodictya leinahoni* (Kirkaldy).

Chochabamba, Bolivia, one specimen.

This species was described as *Hanuala leinahoni*, Kirkaldy, from Peru and Bolivia. It is a typical species of the genus *Leptodictya*, Stål, subgenus *Hanuala*, Kirk. Of the twenty-five species of *Leptodictya* described from North and South America *leinahoni* is the largest and one of the most striking members of the genus.

### *Teleonemia albomarginata*, Champion. (Pl. V. fig. 2.)

One example, Magdalema, Brazil, Aug. 1877, collected by Dr. Otto Thieme (Distant collection).

This species is widely distributed in tropical America; specimens have been examined from Guatemala, Panama, Trinidad, Brazil, Dutch Guiana, Paraguay, Peru, Venezuela, and Columbia.

### *Teleonemia spectabilis*, sp. n.

Of the same build, general appearance, colour, and markings as *T. albomarginata*, Champ., from which it may be distinguished by the much narrower paranota, median carina not subangularly raised on the disc, spines on the head a little shorter, and a longer darkened area at the apex of elytra. Head black, slightly more tumid than in *T. albomarginata*, the spines moderately long, blunt, and dark brown. Rostral channel open behind, the sides testaceous; rostrum extending to the metasternum. Bucculæ closed in front, brownish black, lighter behind. Antennæ black, elongate, moderately stout; segment i. short, moderately stout, a little longer and stouter than ii.; iii. very long, slightly curved, about three and one-third times as long as iv., the latter twice the length of the first two taken together.

Pronotum strongly tumid, very coarsely pitted, sharply tricarinate; lateral carinæ slightly constricted behind disc, slightly curved inwardly in front, each uniseriate; median carina more strongly elevated in front, biseriate from hood to slightly beyond middle of transversely swollen area, thence uniseriate; paranota strongly reflexed, uniseriate, contiguous or nearly contiguous with surface of pronotum. Hood as in *T. albomarginata.* Elytra with the discoidal area open behind, or at most with the posterior margin only faintly indicated, the costate nervure separating subcostal and discoidal area slightly bowed; costal area irregularly bi-triseriate to beyond the middle, increasing to four or five rows at its widest part. Pale flavous and testaceous colour-marking as in *T. albomarginata.* Legs long, moderately slender, black.

Length 6·01 mm., width 2·48 mm.

*Holotype* (male), Vicanota, and *allotype* (female), Pachitea, Peru; Drake collection.

The median carina is evenly rounded and biseriate in front.

### *Teleonemia dispersa*, sp. n. (Pl. V. fig. 1.)

Size, form, colour, and marking very similar to *T. albomarginata*, Champ., and *T. spectabilis*, Drake. Costal area very broad, closely reticulated, with four somewhat confused rows of areolæ to beyond the middle, then increasing to six or eight at its widest part; discoidal area open behind. Lateral carinæ slightly constricted as in *T. spectabilis*, each uniseriate; median carina more strongly foliaceous and biseriate in front, uniseriate from near the middle of tumid area to apex of triangular process. Paranota narrow, uniseriate, strongly reflexed, contiguous or nearly contiguous with the surface of pronotum. Other characters and colour and markings very similar to *T. albomarginata.*

Length 6 10 mm., width 2·51 mm.

*Holotype* (male), Chimbo, Ecuador, elevation 1000 ft. (collected by Mr. Rosenberg), in the British Museum, London; *allotype* (female), Muzo, Columbia, in my collection.

The broad costal area separates this species from its congeners. The type is figured, drawn by Mr. A. R. Janson. On account of the characters of the paranota, carinæ, and costal area in *T. dispersa*, and the structure of the paranota and carinæ in *T. spectabilis*, it seems advisable to regard these two forms as distinct species rather than varieties of *T. albomarginata*, Champion.

## EXPLANATION OF PLATE V.

*Fig.* 1. *Teleonemia dispersa*, sp. n., dorsal aspect.
*Fig.* 1 *a.* Median carina of *Teleonemia dispersa*, sp. n.
*Fig.* 2. Median carina of *Teleonemia albomarginata*, Champ.

## XXX.—*Descriptions d'espèces nouvelles appartenant à la famille des* Coccinellides (*Col.*). Par feu Dr. A. Sicard.

Ces insectes m'ont été communiqués par Sir Guy Marshall de l'Imperial Institute of Entomology, et les types sont déposés dans le British Museum.

### *Vibidia tricincta*, sp. n.

Ovata, glabra, nitida, testacea nigro-variegata. Capite punctulato, fronte lata, labro magno, mandibulis, antennis, palpisque rufis, vertice late nigro vel brunneo. Prothorace transverso, antice sinuato, basi immarginato, haud sinuato, lateribus rotundatis, translucentibus. Elytris testaceis (sutura exigue rufotincta) fasciis nigris tribus ornatis, prima subbasali, secunda media, tertia anteapicali utrinque abbreviatis. Subtus rufa, podibus epipleurisque dilutioribus; laminis abdominalibus parvis.

Var. *maculigera.*—Fasciis nigris interruptis.

Long. 3·9–4·0 mm.

Uganda : Kampala, 3. viii. 1927 (*H. Hargreaves*).

En ovale large, glabre et luisante. Tête rousse, insérée dans le corselet jusqu'en avant des yeux, à labre allongé, à front large, et avec un large bandeau noir ou noirâtre sur le vertex. Antennes et palpes roux. Corselet transversal sinué à son bord postérieur qui recouvre une partie des yeux et à travers lequel on aperçoit le bandeau noir du vertex, non sinué ou rebordé à la base, finement relevé et translucide sur les côtés. Ecusson roux. Elytres oblongs, finement relevés en gouttière à leur partie externe, à ponctuation grosse et serrée, comme vernissés, testacés avec la suture étroitement bordée de rougeâtre et trois bandes transversales noires; la première près de la base, onduleusement convexe en avant, se terminant en dehors sur le calus, un peu plus rapprochée de la suture que du bord externe, la seconde vers le milieu de l'élytre, à peu près rectiligne, ne touchante pas la suture très rapprochée en dehors du bord interne qu'elle atteint parfois; la troisième en forme de petit trait légèrement oblique en arrière et en dehors, éloigné de l'extrémité. Dessous roux, pubescent; pattes testacées, ainsi que les épipleures. Plaques abdominales étroites, très petites.

Var. *a.*—Bandes 1 et 2 divisées en deux traits courts.

Très voisine de la *Vibidia bisoctonotata*, Well., mais plus grosse, à taches réunies en forme de bandes, à ponctuation élytrale plus fort et à trois bandes au lieu de quatre rangées de points, la 3^e^ bande étant située entre la 3^e^ et l'extrémité dans l'espace compris entre les 3^e^ et 4^e^ bandes de la *bisoctonotata*.

Je possédais déjà cette espèce du Harrar et un exemplaire d'Alitea (?), Abyssinie. C'est ce dernier, un peu plus petit que les autres chez lequel les bandes élytrales sont réduites à des traits.

### *Rodolia obscuricollis*, sp. n.

Subrotundata, brunneo-rubra, griseo pubescens, capite prothoraceque nigris, pectore leviter infuscato, tibiis latis, curvatis. Prosterno brevissimo, haud carinato, pilis longis raris rufis instructo. Unguiculis late dentatis; pedibus rufis, femoribus plus minusve infuscatis. Alis nigricantibus.

Long. 3–4 mm.

CAPE PROVINCE: East London, viii. 1926 (*H. T. Holden*). Feeding on *Icerya euphorbiæ*, Br., on *Euphorbia*.

Subarrondie, d'un rouge brun, couverte d'une pubescence grisâtre très courte, avec la tête et le corselet noirs ou d'un brun foncé. Tête assez grosse, à front allongé, finement pointillée et fortement pubescente. Antenne et palpes d'un brun roux. Corselet foncé brun ou noir, luisant, finement pointillé, à pubescence courte et dense, à côtés presque droits, fortement convergents, les angles postérieurs très accusés, les antérieurs arrondis. Ecusson roux. Elytres d'un brun rouge, finement pubescents de gris, luisants, très étroitement rembrunis sur la tranche. Dessous d'un rouge brun, pubescent, avec les tibias et l'extrémité de l'abdomen légèrement plus foncés ; tibias très larges, incurvés, mais non anguleux sur leur arête externe ; ongles très courts, largement dentés. Prosternum très court, non caréné, avec quelques rares longs poils jaunâtre fortement incliné d'arrière en avant.

Cette espèce se distingue facilement par la couleur foncée du prothorax contrastant avec la couleur rouge des élytres. Elle se distingue de l'*usambarica*, Ws., entr'autres caractères par ses pattes rousses et non noires.

### *Scymnus* (*Pullus*) *luniferus*, sp. n.

Subrotundatus, valde convexus, griseo-pubescens; capite rufo, antennis palpisque dilutioribus. Prothorace nigro, lateribus fere rectis, antice convergentibus, basi leviter sinuato, tenue punctulato. Elytris nigris, rotundatis, macula magna dorsali, communi, rotundata rufa, ad suturam antice posticeque leviter emarginata ornatis; subtus nigrescens, abdomine pectoreque rufis. Carinis prosterni approximatis, antice junctis, laminis abdominalibus parvis, completis.

Long. 1·7–2·0 mm.

TANGANYIKA TERRITORY: Amani, 20. ii. 1926 (*A. H. Ritchie*).

Subarrondi, régulièrement convexe, couvert d'une pubescence grisâtre qui masque légèrement la couleur du fond. Tête rousse, finement pointillée avec les antennes et les palpes un peu plus clairs. Corselet noir, à côtés presque droits convergents en avant, subsinué à la base, finement pointillé. Elytres de la largeur du corselet à la base, courts, régulièrement arrondis jusqu'à l'extrémité, à calus huméral petit, mais très distinct, à pubescence grisâtre un peu plus longue que celle du corselet, mais avec une grosse tache discale commune arrondie rousse, courant tout le milieu des élytres, laissant à peu près une bordure égale à un quart de la longueur à la base et à l'extrémité, et à un sixième sur les bords latéraux de la couleur du fond, cette bordure un peu anguleusement avancée en avant et en arrière le long de la suture. Dessous brun sur la poitrine avec l'abdomen roux. Carènes du prosternum rapprochées, réunies en avant en angle arrondi. Plaques petits, atteignant à peine les deux tiers du premier arceau abdominal. Pieds entièrement roux.

Cette espèce rappelle par son coloris, mais en tout petit, certains *Solanophila* de l'Amérique du Sud : *humboldti, pilifera*, etc.

### *Scymnus* (*Sidis*) *ancoralis*, sp. n.

Late ovatus, parum convexus, griseo-pubescens. Capite nigro, labro rufo, palpis antennisque fulvis. Prothorace nigro, nitido, punctulato. Elytris rotundatis, nigris, plaga magna longitudinali apice extus prolongata, nec suturam nec apicem attingente ornatis; subtus castaneus, prosterno carinulis binis abbreviatis instructo, laminis abdominalibus magnis, marginem segmenti fere attingentibus, lateraliter prolongatis. Pedibus luteis, femoribus leviter infuscatis.

Long. 2 mm.

Kenya Colony : feeding on *Pseudococcus citri* on coffee, 1925 (*H. Wilkinson*).

En ovale court et peu convexe, couvert d'une pubescence grisâtre qui passe au brun et devient plus dense à la partie inférieure du corps. Tête brune, luisante, finement pointillée. Corselet entièrement noir, luisant, finement pointillé, à angles postérieurs presque droits, non sinué à la base. Elytres de la largeur du corselet ; sans calus huméral, largement arrondis à l'extrémité, à ponctuation bien plus forte que celle du corselet, noirs avec une tache jaune étendue longitudinalement du quart aux cinq sixièmes de la longueur, deux fois plus rapprochée de la suture que du bord externe, couvrant à peu près à sa partie antérieure les deux cinquièmes de la largeur et dilatée brusquement à angle vif un peu après la moitié de sa longueur un prolongement large dirigé vers le bord externe qu'il atteint presque, sa partie postérieure restant arrondie. La partie noire postérieure ainsi délimitée constituant un dessin en forme d'ancre dont les deux crochets seraient situés le long du bord postérieur de l'élytre, la partie allongée représentée par la suture assez largement noire.

### *Scymnus c-luteum*, sp. n.

Obovatus, parum convexus, brunneus luteo-variegatus, parce pubescens. Capite rufo (? ♂), vel brunneo, labro dilutiore (? ♀), antennis palpisque testaceis. Prothorace brunneo nitido, lateribus sordide flavescentibus, fere rectis, antice leviter convergentibus. Elytris basi rotundatis, callo humerali obsoleto, lateraliter parum incurvatis, brunneis, plaga magna longitudinali antice et postice extus dilatata ornatis, apice ipso leviter luteo. Subtus ochraceus, pectore medio infuscato, carinis prosterni fere parallelis; laminis abdominalibus magnis, marginem posticum, segmenti fere attingentibus; metasterno grosse punctato.

Long. 1·8 mm.

Uganda : Kampala, 1. iii. 1927 (*H. Hargreaves*).

En ovale court, peu convexe d'un brun châtain varié de testacé en dessus. Tête jaune (? ♂) ou brun avec le labre clair (? ♀) ; antennes et palpes testacés. Corselet convexe, brillant, très finement pointillé, à angles postérieurs arrondis, les antérieurs plus ou moins aigus, à côtés presque droits, légèrement convergents en avant, faiblement sinué à la base de chaque côté de l'écusson, d'un brun châtain sur le disque avec les côtés progressivement plus clairs, assez largement chez le ♂, plus étroitement chez la ♀. Elytres de la largeur du corselet à la base, arrondis aux épaules, faiblement arqués sur les bords, à calus huméral obsolète, à ponctuation un peu plus grosse que celle du corselet, d'un brun châtain avec l'extrémité étroitement testacée et sur chaque élytre une tache longitudinale de la même couleur, en forme de C, couvrant à peu près le tiers de la largeur vers le milieu, dilatée en dehors à sa deux extrémités, la dilatation antérieure oblique en avant, la postérieure transversale. Cette espèce ressemblerait ainsi à peu près par son dessin à un *N. pulchellus* ayant les deux taches réunies en dedans ; d'autre part, je n'ai pas vu d'exemplaires à taches séparées.

Dessous jaunâtre avec le milieu de la poitrine rembruni, métasternum à grosse ponctuation, abdomen densément ponctué, mais à points un peu moins gros. Carènes prosternales presque parallèles ; plaques fémorales grandes, un peu aplaties, prolongées jusqu'aux cinq sixièmes du segment, remontant un peu en avant et interrompues vers le tiers de la longueur de l'arceau, sans atteindre le bord antérieur.

Le *Scymnus* (*Pullus*) *quisquilius*, Weise, qui m'est inconnu, doit avoir un dessin analogue et s'en distinguer, outre les caractères subgénériques, par une forme plus courte, plus convexe, plus arrondie.

### *Scymnus ardosiacus*, sp. n.

Late ovatus, convexus, griseo-pubescens. Capite thoraceque rufis, elytris nigris, apice late rufo-limbatis ; subtus rufus, meso-metasternoque nigris ; abdomine rufo, segmento basali in medio infuscato ; pedibus rufis.

Long. 2·9 mm.

Gold Coast : Essiania, xi. 1927, déprédateur de l'*Aspidiotus destructor* (*G. S. Cotterell*).

En ovale large, convexe, couvert d'une pubescence grisâtre serrée qui le fait paraître ardoisé sur les parties noires de dessus, à ponctuation fine et simple. Tête et corselet roux, ce dernier un peu plus pâle sur les côtés. Palpes et antennes roux avec l'écusson de la même couleur. Élytres noirs à pubescence grise masquant un peu la couleur foncière, de la largeur du corselet à la base, régulièrement arrondie jusqu'à l'extrémité, apex avec une tache rousse en forme de croissant à concavité antérieure, couvrant à peu près le sixième de la longueur à la suture et étendue jusqu'au quart postérieur des côtés. Dessous roux avec le méso- et le métasternum noirs, ainsi que le milieu du premier arceau ventral. Prosternum très court, en carré un peu allongé, portant de chaque côté une fine carène parallèle à celle du côté opposé. Plaques abdominales étroites, atteignants au moins les trois quarts de l'arceau, en ogive largement arrondies remontant en avant en direction de la partie interne de l'épimère qu'elle n'atteint pas. Pieds roux.

Ressemble à un *Sc. ferrugatus*, un peu plus petit et un peu plus court, à corselet entièrement roux.

### *Scymnus erinaceus*, sp. n.

Subrotundatus, convexus, pube brunnea semierecta vestitus. Rufus, elytris nigris, apice rufo-limbatis. Prosterno carinis binis leviter convergentibus instructo ; laminis abdominalibus marginem segmenti attingentibus, abbreviatis. Pedibus pallidioribus.

Long 1·7 mm.

Fiji ? 17. iii. 1929 (*W. Greenwood*).

Arrondi, très convexe, à pubescence brune, plus claire sur la tête et le corselet que sur les élytres, semi-dressée. Tête, prothorax et écusson roux, à ponctuation fine et peu dense. Elytres de la largeur du corselet à la base, régulièrement arrondis jusqu'à l'extrémité, à calus huméral peu distinct, à ponctuation forte, très serrée, contrastant avec celle de l'avantcorps, noirs avec, à l'extrémité, une bordure rousse en ligne droite en avant, couvrant à peu près le sixième de la suture et le tiers du bord latéral. Dessous roux ; prosternum court, muni de deux fines carènes légèrement convergentes en avant ; mésosternum court, carré ; métasternum grand, à peine ponctué ; abdomen ponctué et pubescent. Lignes fémorales grandes, atteignant le bord postérieur du segment abdominal, fortement raccourcies en dehors, enclosant une plaque fémorale entièrement lisse.

Cette espèce se distingue facilement de toutes les autres de couleur analogue par sa pubescence semi-dressée et la forte ponctuation de ses élytres.

## ORCULUS, gen. nov.

Tête large avec les yeux petits, arrondis. Antennes très courtes, de 11 articles, palpes maxillaires à dernier article gros et conique. Corselet en croissant lobé sur les côtés comme chez certaines Chilocorides, ni sinué ni rebordé à la base, mais avec un fin rebord latéral. Elytres de la largeur du corselet à la base, acuminés en arrière ; forme générale d'un *Orcus* ou d'un *Exochomus*, mais sans canthus.

Prosternum très court, incliné d'arrière en avant et de haut en bas, formant ainsi un plan incliné sur lequel repose la partie inférieure de la tête dont la partie antérieure vient s'appuyer sur le mésosternum, le prosternum restant ainsi entièrement caché. Mésosternum en forme de bande transversale étroite bordant en avant le métasternum. Ce dernier grand, prolongé entre les hanches intermédiaires qui sont très écartées ainsi que celles des autres paires, ce prolongement finement rebordé. Epimères très grandes. Premier segment ventral grand, presqu'aussi long que tous les autres réunis ; deux et trois en forme de bande mince, quatre presque aussi long que les deux précédents, cinq un peu plus court, arrondi en arrière. Prolongement intercoxal du premier segment ventral très large, coupé carrément et non rebordé à sa partie antérieure. Lignes fémorales bien nettes, dirigées d'abord directement en arrière, puis au niveau du milieu du segment coudées à angle droit et se dirigeant vers le bord latéral du segment. Pattes robustes, fémur sillonné pour recevoir le tibia, tarses à premier et deuxième article court, ce dernier fortement lobé, onychium coudé et grêle, ongles simples (?).

Ce genre se rapproche du genre *Martinella*, Sic., par l'inclinaison de la tête et l'écartement des hanches. Il s'en distingue par la forme de son prosternum recouvert par la tête et incliné en avant comme chez certaines *Rodalia*. La pubescence est longue et clairsemée, la ponctuation peu dense, chaque point donnant naissance à un poil fin et long.

### *Orculus castaneus*, sp. n.

Convexus, postice acuminatus, longe parceque griseo-pubescens; supra brunneo-fuscus, lateribus anguste dilutioribus, subtus castaneus, antennis, palpis pedibusque plus minusve testaceis. Epipleuris latis.

Long. 1·1 mm.

Sierra Leone: Gippi, sur *Cocos nucifera*, viii. 1926 (*E. Hargreaves*).

Convexe et acuminé en arrière avec une longue pubescence d'un gris jaunâtre, clairsemée, ne masquant pas la couleur foncière; d'un brun assez foncé en dessus avec les bords latéraux étroitement plus clairs. Corselet en forme de croissant, très finement ponctué et pubescent. Elytres de la largeur du corselet à la base, arrondis avec une fine tranche latérale prolongée au delà des deux tiers de la longueur. Dessus des élytres éparsement ponctué, chaque point étant pilifère, lisse entre ces points. Epipleures larges, étendues presque jusqu'à l'extrémité. Dessous pubescent, plus clair que la dessus. Pattes robustes avec les tarses relativement longs.

Cet insecte a l'apparence d'une toute petite *Pentilia* pubescente.

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## XXXI.—*Notes on the Genus* Iris, *Saussure* (*Orthoptera*, Mantidæ). By B. P. Uvarov.

[Plate VI.]

### *Iris radians*, sp. n. (Pl. VI. fig. 1.)

♂.—Slightly smaller and more slender than *I. oratoria* (L.), and differing strikingly from it and from other known species, except *I. nana*, Uv., by the peculiar radiated pattern of hind wings. *I. nana* differs from the new species by its considerably smaller size, relatively shorter pronotum, and other characters clear from the descriptions.

Head about twice the greatest width of the pronotum. Facial shield more than twice as broad as it is high; its upper margin strongly arched, almost obtusangular; all margins distinct, but not sharp; there is a low callous tubercle at each of the four angles and a pair of tubercles near the middle of the shield; there is no median carinula.

Pronotum relatively longer and more slender than in *I. oratoria.* Prozona practically parallel-sided; metazona distinctly narrowed.

Elytra slightly shorter than the abdomen, practically hyalinous throughout, subopaque only in the anterior half. Venation as in *I. oratoria.* Wings distinctly shorter than the elytra, with the apex parabolic.

Anterior coxæ with 6–7 spinules along the upper margin and with a line of low callous tubercles on the inner surface.

Pale brownish buff. The discoidal and the large internal and external spines of front femora heavily marked with black in their basal parts and apically; the small internal spines black apically only. First joint of front tarsus black inside.

Hind wings purplish in the basal two-thirds of the first lobe, *i. e.*, from the costa to the dividing vein, without hyaline spots typical for *I. oratoria.* Brown pattern of the wings is concentrated along the alternate anal veins which are distinctly incrassate, and there is no concentration of the brown colour corresponding to the subbasal spot of *I. oratoria,* while the concentric pattern is clearly interrupted between the alternate anal veins (see Pl. VI. fig. 1).

Total length 40; pronotum 11; front coxa 6·5; elytron 22; wing 20 mm.

Described from a single male taken at light at Lyallpur, Punjab, 1. ix. 29, and submitted to the Imperial Institute of Entomology by the Government Entomologist, Punjab.

### *Iris oratoria cæca,* subsp. n. (Pl. VI. fig. 2.)

♂.—Differs from the typical (European) form by the black pattern of the hind wings represented only by a series of concentric fasciæ, which are broader and partly confluent near the base, but do not form a solid spot typical for the European subspecies. Large internal spines of anterior femora each with a black spot at the base and black tip; external spines on their inner sides black, with a brown ring in the middle. Pronotum with brown stripes along the margins.

Total length 42; pronotum 13; front coxa 8·5; elytron 31? (tip broken off); wing 27 mm.

Described from a single male taken in the Khor Arbat Delta, Sudan, iv.–v. 1926 (*H. B. Johnston*).

The occurrence of *Iris oratoria* in the Sudan is somewhat unexpected, and it is not surprising that the species is represented there by a distinct subspecies.

### *Iris oratoria polystictica* (F.-W.).

1846. *Mantis polystictica*, Fischer-Waldheim, N. Mém. Soc. Natur. Moscou, vol. viii. p. 102, pl. ii. fig. 4.
1915. *Iris tiflisina*, Giglio-Tos, Bull. Soc. Ent. Ital. vol. xlvi. p. 74 (*syn. nov.*).

Specimens of *Iris oratoria* from S.E. Russia (Sarepta), Turkestan, and Transcaucasia differ from the Mediterranean ones by their smaller size and particularly by the absence of hyaline "windows" in the brownish discoidal part of the hind wings. Fischer-Waldheim's *M. polystictica*, described from Dauria, appears to represent this form, and specimens from Tiflis, Transcaucasia, which I have before me, and which represent *I. tiflisina* of Giglio-Tos, cannot be separated from the Turkestan specimens. I feel justified, therefore, in considering *I. tiflisina* as a synonym of *polystictica* and in regarding this peculiar form as a subspecies of *I. oratoria*. The colour-characters of the femoral spines, as given by Giglio-Tos, are not sufficiently constant.

### *A List of Known Species and Subspecies of the Genus* Iris.

Giglio-Tos has listed ('Das Tierreich,' Lief. 50, Mantidæ, 1927, p. 332) four species of the genus *Iris*, and in the Supplement to the Monograph (*l. c.* p. 652) three more species, recently described by me, are mentioned. One more species, *I. nana*, has been added to the list by me in 1930 (Ann. & Mag. Nat. Hist. ser. 10, vol. v. p. 632), and another new species and new subspecies of *I. oratoria* are described above. One of Giglio-Tos's species, *I. tiflisina*, is regarded by me as a synonym of *polystictica*, F.-W., and considered as only a subspecies of *I. oratoria*.

While all known species of *Iris* are distributed over the southern parts of the Palæarctic Region, ranging into the Sudan and into N.W. India, there are two species described in the genus which are tropical in their distribution. One of them is the mysterious *Mantis fasciata* of Olivier, described from a figure by Stoll, who himself called the species *M. strigosa*. Several authors redescribed this species, but always from Stoll's figure, which is said to represent an insect from

Surinam. Dr. Blöte, of the Leiden Museum, was unable to find Stoll's type of *M. strigosa*, and it is probably lost. The figure is not sufficiently good to decide that the insect represented is actually an *Iris*, and the same type of wing-pattern occurs in several widely-separated genera of Mantidæ. Since it is highly improbable to find a representative of a Palæarctic genus in Surinam, I am fully convinced that *Mantis fasciata* does not belong to the genus *Iris* at all.

Another extra-Palæarctic species described in the genus is *I. tricolor*, Werner, from S.W. Africa, mentioned in the supplement to Giglio-Tos's monograph (*l.c.* p. 652). The species is compared by its author with *I. kuhlgatzi*, Karny, which is a *Carvilia*, and with *I. rogenhoferi*, Sauss., which belongs to the genus *Metentella*. There is little doubt that *I. tricolor* should be removed from the genus *Iris*, though I am unable to say to which other genus.

Thus the following seven species (one of them with three subspecies) are known in the genus *Iris* at present:—

1. *Iris oratoria* (Linnæus, 1758).

This species has been described originally from "Africa," which most probably means Algeria, and this fact should be taken into account when geographical forms of the species are studied. There is no doubt that a thorough study of specimens of *I. oratoria* from the various parts of the area inhabited by *I. oratoria* will result in the recognition of several distinct subspecies, in addition to the following three:

1 *a*. *Iris oratoria oratoria* (L.).—N.W. Africa.

1 *b*. *Iris oratoria polystictica* (Fischer-Waldheim, 1846).—Dauria, Turkestan, Transcaucasia, S.E. Russia. I. Bolivar (Novit. Zool. vol. xx. 1913, p. 604) recorded this form from the Algerian Sahara, but the specimens have been re-examined by me and referred to a new species, *I. deserti* (see below).

1 *c*. *Iris oratoria cæca*, Uvarov, 1931.—Sudan.

2. *Iris deserti*, Uvarov, 1923.—Algerian Sahara.

3. *Iris persa*, Uvarov, 1922.—S. Persia.

4. *Iris radians*, Uvarov, 1931.—Punjab.

5. *Iris nana*, Uvarov, 1930.—Mesopotamia.

6. *Iris orientalis*, Wood-Mason, 1882.—India.

7. *Iris splendida*, Uvarov, 1922.—Afghanistan.

### *Key to the Males of the Genus* Iris.

1 (2). Elytra transparent except in the preradial area. Wings entirely transparent, with a subcentral round black spot and some concentric spots .......................... 6. *orientalis*, W.-M.
2 (1). Elytra transparent only in the posterior half of the postradial area. Wings opaque.
3 (8). Discoidal field of wings with hyaline windows in the cells.
4 (7). Wings with a large round subcentral spot and concentric fasciæ.
5 (6). Facial shield about half as broad again as it is high, imperfectly marginated above. Elytra short and broad, distinctly narrowed apically ........ 3. *persa*, Uv.
6 (5). Facial shield more than twice as broad as it is high, distinctly marginated above. Elytra long, practically parallel-sided .................. 1 *a. oratoria oratoria* (L.).
7 (4). Wings without a subcentral black spot, only with concentric fasciæ ...... 1 *c. oratoria cæca*, Uv.
8 (3). Discoidal field of wings entirely opaque, without hyaline windows.
9 (12). Wings with a subcentral round black spot.
10 (11). Subcentral black spot of wings large, surrounded by numerous concentric fasciæ ........................ 1 *b. oratoria polysticta* (F.-W.).
11 (10). Subcentral black spot of wings small; concentric fasciæ few in number, interrupted, very pale in colour .. 2. *deserti*, Uv.
12 (9). Wings without a round subcentral spot.
13 (14). Size normal for the genus. Black pattern of hind wings consists of a series of rays along the veins, with zigzagged margins .............. 4. *radians*, Uv.
14 (13). Size very small for the genus. Hind wings with the ray-pattern confluent ........................ 5. *nana*, Uv.

The above key does not include *I. splendida*, Uv., of which the female only is known, but this species has a most distinctive type of wing-coloration, and cannot be confused with any other.

## EXPLANATION OF PLATE VI.

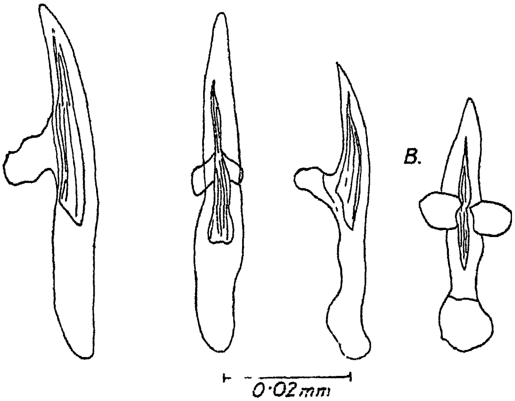
*Fig.* 1. *Iris radians*, sp. n., ♂.
*Fig.* 2. *Iris oratoria cæca*, sp. n., ♂.

## XXXII.—*A new Cestode from the Grey Hornbill in India.*

By L. N. Johri, M.Sc., Department of Biology, University of Rangoon.

The material for this paper was obtained from *Lophoceros birostris* (Scopoli, 1786), the common grey hornbill (Lāmdār or Dhānesh) from the district Pilibhit, in the United Provinces, India. Five complete tapeworms were found, two from the duodenum and three from the anterior intestine. Incomplete strobilæ were obtained mainly in the large intestine, two together with the complete worms in the small intestine.

Fig. 1.



Rostellar hooks of *Paruterina meggitti*, sp. n.

A. Long rostellar hooks. B. Short rostellar hooks.

Maximum length 20–64*, width 0·5–1·0. Scolex, maximum length 0·311–0·38 and maximum diam. 0·4–0·45; rostellum, 0·165–0·185 diam., armed with approximately 44 hooks, arranged in two rows of short and long hooks, each measuring 0·039–0·048 and 0·050–0·061 respectively (to ascertain the exact number of hooks it is necessary to make a separate mount of the rostellum in such a way as to expose all of them, otherwise the overlapping of dorsal and ventral sides causes confusion). Suckers nearly spherical, 0·2 max. diam. Neck absent, very faint segmentation starts immediately posterior to the level of suckers. All segments much broader than long, except a few posterior, which show a comparative reduction in width and some increase in length.

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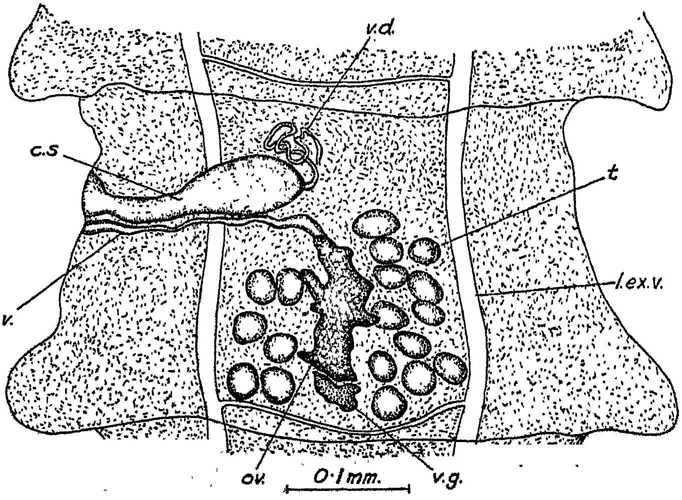
* All measurements in mm.

Genital pores unilateral, alternating irregularly at centre of proglottis margin or slightly anterior to it. Genital ducts pass between dorsal and ventral longitudinal excretory vessels. Cirrus-sac 0·172–0·29 long, extending to ventral longitudinal vessel or passing it. Vas deferens greatly convoluted. Testes 13–19, lateral to ovary, with a few posterior to it. Ovary generally elongated, extending nearly from the centre of the proglottis to its posterior margin, with processes in various directions. Vagina slightly coiled and opening separately posteriorly to cirrus-sac.

Fig. 2.



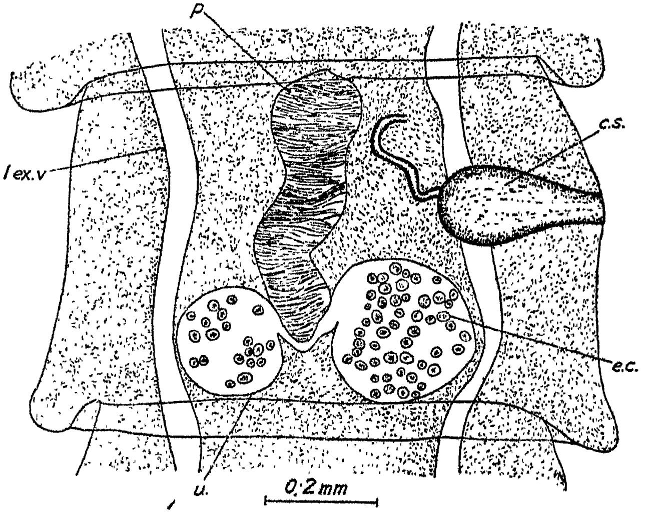
Mature proglottis of *Paruterina meggitti*, sp. n.

*c.s.*, cirrus-sac; *l.ex.v.*, longitudinal excretory vessel; *ov.*, ovary; *t.*, testis; *v.*, vagina; *v.d.*, vas deferens; *v.g.*, vitelline gland.

In course of the development of the proglottis, the uterus develops as a circular sac containing eggs, and gradually becomes more and more prominent posteriorly until the ovary disappears. Anteriorly to the uterus-sac, a paruterine organ develops and extends longitudinally towards the anterior border of the proglottis, with a marked curve at some little distance from the uterus; over it are prominent transverse fibrous markings. Generally the uterus is bilobed, with the two halves connected by a duct, anteriorly in contact with the basal portion of the paruterine organ. In some segments only a single lobe of the uterus is present; often the uterus appears as a single sac giving out a small outgrowth, probably the rudiment of the missing lobe. Sometimes the lobes of the uterus are three in number. Cirrus-sac and longitudinal excretory vessels remain quite distinct in these posterior segments.

The possession of unilateral genital pores separates the present form from *P. angustata*, Fuhrmann, 1906, *P. fuhrmanni*, Baczynska, 1914, and *P. guineensis*, Joyeux, Gendre & Baer, 1928. Of the remaining species of this genus, the small size of the rostellar hooks sufficiently separates *P. cholodkowskii*, Skrjabin, 1914, and *P. similis* (Ransom, 1909); similarly, *P. parallelopipeda* (Rudolphi, 1809) is separated by their number and shape, and *P. otidis*, Baczynska, 1914, by their number. The number and arrangement of testes distinguish *P. melierax* * (Woodland, 1929). The larger number of rostellar hooks, together with their smaller size and different shape, the smaller range of testes, and the larger size of the cirrus-sac characterizes *P. bucerotina*, Fuhrmann, 1909. The species most closely allied is *P. candelabraria* (Goeze, 1782), which differs, however, in the

Fig. 3.



Gravid proglottis of *Paruterina meggitti*, sp. n.
*e.c.*, egg-capsule; *p.*, paruterine organ; *u.*, uterus.

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* Included in this genus by virtue of its rostellum. To include this species in the genus *Rhabdometra* would fuse the two genera *Rhabdometra* and *Paruterina*.

larger number of testes, the smaller size of the small rostellar hooks and of the cirrus-sac, and in the general shape of the rostellar hooks. It is, therefore, necessary to create for the Indian form a new species, which I have great pleasure in naming *Paruterina meggitti*, in acknowledgment of my indebtedness to Prof. F. J. Meggitt.

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## XXXIII.—*A Reconstruction of* Stenognathus gouldi *(Newberry)*. By ANATOL HEINTZ, Curator of the Palæontological Museum, Oslo, Norway.

(Published by permission of the Trustees of the British Museum.)

IN the collection of the British Museum is a fine slab from Ohio, U.S.A., containing the remains of a *Stenognathus* (B.M. P. 9335). This specimen has been studied by L. Hussakof (1911, Geol. Mag. (v.) viii. p. 126, text-fig. 6, pl. viii. fig. 5), and determined as *Stenognathus gouldi* (Newberry).

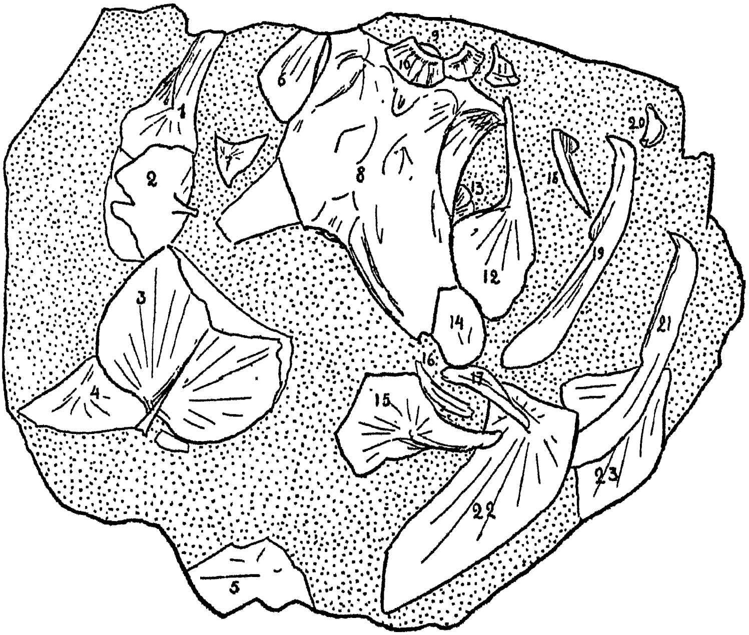
Thanks to the courtesies extended to me by Dr. W. D. Lang, F.R.S., the Keeper of Geology, I have had the opportunity of making a thorough re-examination of this interesting specimen.

The specimen in question is unusually complete. All the plates of the head and body are preserved except the median-ventral, the anterior-median-ventral, and the posterior-lateral. In fig. 1, which is a redrawing of Hussakof's figure with the addition of certain plates hitherto unidentified, the relative positions of the individual plates, all of which are shown from the inside, are clearly seen.

### *The Body-armour.* (Figs. 1 & 2.)

The rounded median-dorsal plate is well preserved (fig. 1, *3*; fig. 2, *MD*); it bears a strongly developed median keel, the hinder part of which is thickened and deeply excavated behind, thus closely resembling the keel in *Dinichthys*.

Fig. 1.

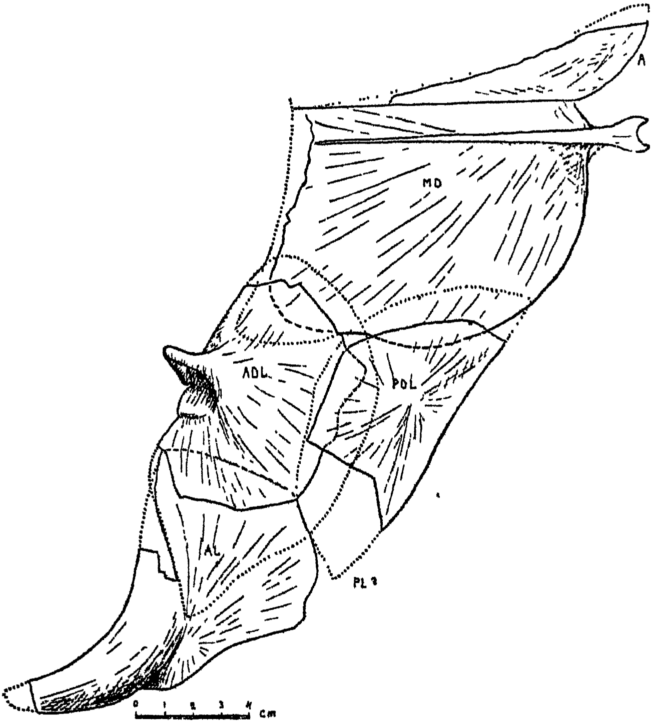


Slab with remains of *Stenognathus gouldi* (Newberry). A partly diagrammatical drawing, somewhat modified after Hussakof. Brit. Mus. P. 9335. × ½ diam.

*1* and *15*, anterior-lateral; *2*, anterior-dorso-lateral; *3*, median-dorsal; *4*, posterior-dorso-lateral; *5*, posterior-ventro-lateral; *6* and *12*, suborbital; *7*, post-suborbital; *8*, *9*, and *14*, the head-shield; *10* and *13*, sclerotic plates; *11* and *20*, antero-supro-gnathal; *16* and *17*, ? intero-lateral; *18*, postero-supro-gnathal; *19* and *21*, inferognathals; *22* and *23*, anterior-ventro-laterals.

Only the right anterior-dorso-lateral plate is present (fig. 1, *2*; fig. 2, *ADL*). It lies close to the median-dorsal in its correct position. The condyle is strongly developed and shows the same characteristic structure as in *Dinichthys*. As we know that the condyle must have been horizontal in position, so as not to obstruct the movement of the head, we can deduce the correct position of the anterior-dorso-lateral, and so reconstruct the cross-section of the body carapace. Such a reconstruction is given in fig. 3. It shows that *Stenognathus* was a remarkably high and narrow form.

Fig. 2.

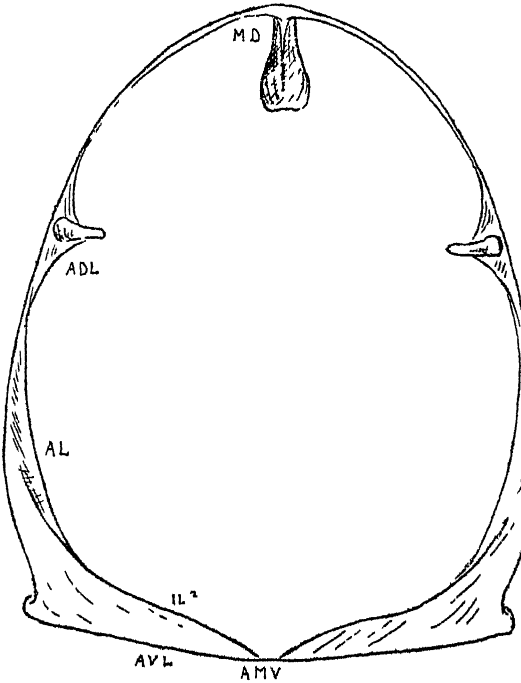


*Stenognathus gouldi* (Newberry). Reconstruction of the right side of the dorsal shield, based on specimen Brit. Mus. P. 9335, internal view. × 3/8 diam. (circ.).

*A*, side-view of median keel.

Both anterior-lateral plates are preserved (fig. 1, *1* and *15* ; fig. 2, *AL*), the right plate being in its natural position in contact with the anterior-dorso-lateral. They are relatively broad in the upper part and narrow but thick in the lower inner part, thus resembling the corresponding plates in *Titanichthys*, and differing from those in *Coccosteus* or *Dinichthys*, in which the lower anterior part is strongly developed.

Fig. 3.



*Stenognathus gouldi* (Newberry). Reconstruction of the cross-section of the body-armour. × 1/3 diam. (circ.).

The right posterior-dorso-lateral (fig. 1, *4* ; fig. 2, *PDL*) is displaced and lies posterior to the median-dorsal. It is a relatively large triangular plate, similar in form to that of *Dinichthys*.

The posterior-laterals are missing.

Of the ventral shield only the two anterior-ventro-laterals, long and narrow in form, are preserved (fig. 1, *22* and *23*).

The posterior-ventro-laterals are represented only by some fragments (fig. 1, *5*). Two small plates (fig. 1, *16* and *17*) lying between the left anterior-lateral and the left anterior-ventro-lateral must be regarded as fragments of either the intero-lateral or of the spinal.

### *The Head-shield.* (Figs. 1 & 4.)

*The head-shield* is also well preserved. In spite of the difficulty in determining the limits between the individual plates it is possible to obtain some idea of their form by studying the position of the centres of ossification and the grain of the bone.

The rostral (fig. 1, *9*; fig. 4, *R*) is unusually broad and large, and so is the preorbital. The preorbital process is especially strongly developed and massive (fig. 4, *prop.*), but the hinder part of the head is quite thin except where thickened along the posterior margin from the median-basal to the *fossa condylis* on the externo-basal*. The median-basal is small yet thick, and shows a pair of deep impressions where the muscles of the neck were attached (figs. 4 and 5, *MB*). The posterior lateral corners of the head are very long (fig. 1, *14*), so that the head is unusually broad in the hinder part. Here one can see traces of a plate, the "angulare," hitherto recognized only in *Phlyctænaspis* (Traquair) and *Heterostius* (Heintz). It forms the posterior lateral angle of the head (figs. 4 & 5, *PM*), and has also been found by me in *Dinichthys* and *Coccosteus*. I propose to name it the "postmarginal" plate.

The pineal plate is relatively small, with a very distinct depression (fig. 4, *P*).

The relative position and size of the other plates can be seen in figs. 4 and 5.

The fragments of both the sclerotic rings are preserved (fig. 1, *10* and *13*; fig. 4, *Sc*), the sclerotic plates of the right eye being especially clear. Two of the plates are in natural contact, making the reconstruction of the whole ring an easy matter. It is obvious that, compared with the corresponding structures in *Dinichthys* or *Coccosteus*, the sclerotic rings in *Stenognathus* are unusually large.

The left suborbital plate is nearly complete, but only a fragment of the right remains (fig. 1, *12* and *6*). The shape is characteristic of *Stenognathus*, having a long, narrow, massive front part, and a short, thin, posterior expansion (figs. 4 & 5, *SO*). A small plate immediately behind the right suborbital must be regarded as a post-suborbital (fig. 4, *PSO*). This plate, very well known in *Coccosteus*

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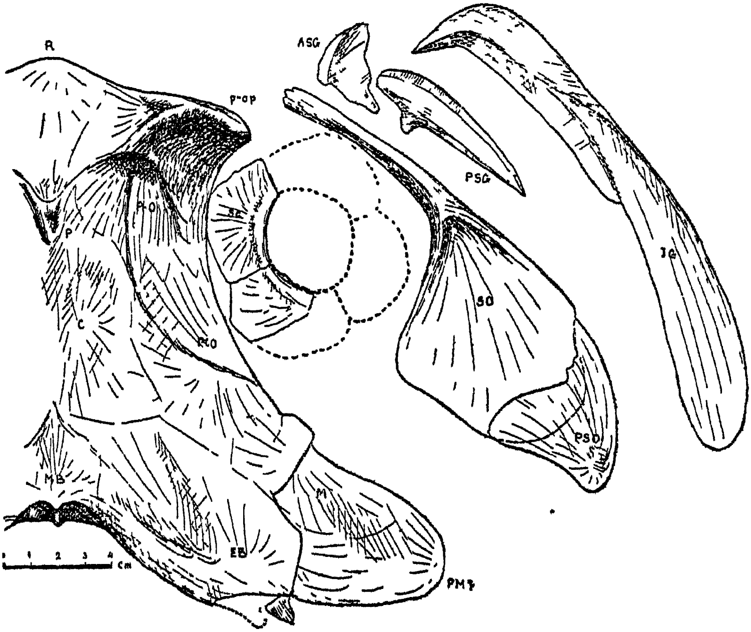
* The term "basal" is used instead of "occipital," as the bones in question have nothing to do with the occipital region of the cranium.

(under the name of "operculum," Woodward; "jugal" or "post-maxillar," Traquair), is described by Jaekel in some Arthrodira from Wildungen (e.g., *Pholidosteus*) and also by me in *Dinichthys*.

The jaw-elements are excellently preserved in this specimen. Only the right postero-supro-gnathal (Maxillar) * is missing.

The infero-gnathals have a form which is typical of *Stenognathus*—very long and thin, with a weakly developed front

Fig. 4.



*Stenognathus gouldi* (Newberry). The left half of the head-shield, internal view. Brit. Mus. P. 9335. × 3/8 diam. (circ.).

"tooth" and a long cutting-edge (fig. 1, *19* and *21*; figs. 4 & 5, *IG*). Corresponding with the form of this bone the antero-supro-gnathal is short and small (fig. 1, *11* and *20*; figs. 4 & 5, *ASG*), and the postero-supro-gnathal is very long and narrow (fig. 1, *18*; figs. 4 & 5, *PSG*). Thus the gnathal elements in *Stenognathus* resemble in shape those in *Dinichthys*; they differ only in being thinner and less strongly developed.

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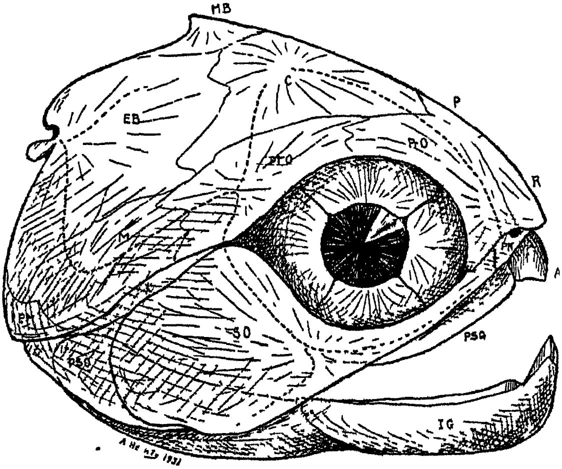
* I adopt the names proposed by Hussakof for the jaw-elements: infero-gnathal for mandibular, antero-supro-gnathal for premaxillar, and postero-supro-gnathal for maxillar. The reason for this will be discussed in a future paper on *Dinichthys*.

The fragments of the head here described are so complete that we may reconstruct the head-shield of this remarkable form. The most characteristic feature of *Stenognathus* is the enormous size of the orbits, which naturally affects the shape of the whole head (fig. 5). The preorbital process is strongly developed and the preorbital is unusually large; the postorbital is placed far back, and the front part of the suborbital is very long and narrow. The course of the sensory canals is also influenced by the enlarged eyes. The postorbital canal, which usually runs from the margin of the postorbital obliquely downwards to the central, is here placed so far back that it runs upwards to the central (this was observed in specimens of *Stenognathus dolichocephalus*, Eastman, in the Buffalo Museum). In contrast to the large eyes the gnathal elements are feeble and cannot be regarded as especially effective weapons.

Fig. 5.



*Stenognathus gouldi* (Newberry). Reconstruction of the head-shield.

The reconstruction (fig. 5) shows two plates not hitherto noted in *Stenognathus*; one is marked *PN*, and represents the postnasal plate. This plate, described as "pre-maxillar" in *Coccosteus* (Traquair) and *Phlyctænaspis* (Woodward), is also found in *Dinichthys* (Heintz) and in many Wildungen

Arthrodira (Jaekel). It meets the rostral, and with this plate forms the boundaries of the nasal openings in Arthrodira. The size and form of the postnasal, as shown in the drawing, is hypothetical. The other plate, marked *X*, is likewise of a problematical character, but has also been found in *Coccosteus* (Heintz, in MS.).

The shape of the head of *Stenognathus* resembles that of certain large-eyed Arthrodira from Wildungen in Germany described by Jaekel, but *Stenognathus* is certainly not closely related to these forms, for the construction of its body-armour shows a much higher degree of specialization than any form from Wildungen.

Jaekel regarded the enlargement of the eyes as clear evidence that the Wildungen Arthrodires were deep-sea forms. I cannot accept this explanation for *Stenognathus*. This form is found in the same deposit as *Dinichthys*, *Titanichthys*, and *Cladoselache*, which can hardly be regarded as deep-sea fishes.

## XXXIV.—*On the African Short-tailed Lemurs or Pottos.*

### By Ernst Schwarz.

The general characters of the Pottos, as in the Galagos, are fairly well known, and need not be discussed here. As in their near relatives, the Oriental Lorises, $P^4$ has no metacone, and there are only two (pectoral) mammæ. In the two African genera there is, moreover, a tendency to reduce the second and third finger. In both *Perodicticus* and *Arctocebus* there are long conspicuous hairs, especially on the nape and fore back, which may be of a silvery colour; they are the remnants of the juvenile coat, and their colour may persist all through life, or at least for a considerable time. The two genera are distinguished as follows:—

| | |
|---|---|
| A. Size small. Head and body 200–270 mm., tail 10–15. Second and third finger reduced, without nail. Premaxillary elongated into a tip .............................. | *Arctocebus*, Gray. |
| B. Size large. Head and body 320–390 mm., tail 50–100. Only second finger reduced. Premaxillary not elongated .............. | *Perodicticus*, Bennett. |

### Perodicticus, Bennett.

Syn. *Potto*, Lesson.

Skull broad, face short. Premaxillary not elongated. $P^2$ elongated, caniniform, without cingulum, but with the blade at the posterior margin sharply defined. $P^3$ small, reduced, separated by a wide diastema from P$^2$ and by a smaller one from P$^4$, low, simple, with the cingulum just indicated, but without protocone. Inner cusp of M$^1$ and M$^2$, not of P$^4$, indistinctly differentiated into protocone and hypocone. Only

*Variation in Skull-measurements in the Subpecies of* Perodicticus potto.

| Subspecies. | Greatest length. | | | C–M$^3$. | | | M$^1$–M$^3$. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Av. | Max. | Min. | Av. | Max. | Min. | Av. |
| *potto*.............. | 63·3 | 60·5 | 61·4 | 21·3 | 18·1 | 20·0 | 8·7 | 7·9 | 8·3 |
| *edwardsi* .......... | 68·0 | 63·1 | 65·8 | 24·3 | 21·7 | 22·9 | 11·4 | 8·6 | 10·0 |
| *faustus*............ | 61·6 | 61·6 | 61·6 | 22·3 | 22·3 | 22·3 | 10·2 | 10·2 | 10·2 |
| *ibeanus* (E. Africa).. | .. | .. | .. | 21·5 | 20·0 | 20·6 | .. | .. | .. |
| „ (Congo) .... | 66·7 | 60·0 | 63·9 | 23·0 | 18·3 | 20·9 | 9·8 | 7·6 | 8·8 |

*Skull-measurements of Type and Topotypical Specimens.*

| Subspecies. | Greatest length. | C–M$^3$. | M$^1$–M$^3$. | |
|---|---|---|---|---|
| *potto* (topotype).. | 60·5 | 18·1 | 7·9 | Brit. Mus. 13.10.4.1; ♂ old; Dunkwa, Gold Coast. |
| *ju-ju* (type) .... | 66·6 | 21·4 | 8·7 | B.M. 2.7.12.1; ♀ old. |
| *batesi* (type) .... | 66·2 | 23·7 | 9·6 | B.M. 98.5.4.12; ♀ old. |
| *faustus* (type) .. | 61·6 | 22·3 | 10·2 | B.M. 11.10.19.9; ♀ young adult. |
| *arrhenii* (type) .. | .. | .. | 9·0 | |
| *ibeanus* (type) .. | 63·7 | 20·0 | 8·3 | B.M. 10.3.18.1; ♂ young adult. |

second finger reduced. Spinal process of cervical vertebræ long.

The number of forms in this genus is considerably less than has hitherto been supposed. There is a very considerable individual variation* as regards the amount of black and brown pigment, but the majority of "species" that have been described are simply based on age-differences. The juvenile coat in all the forms examined is silvery grey all over; it is first changed into cinnamon-brown on the head and nape as far as the shoulder region, the back turning brown only at a later period, and the silvery hairs (on which *Perodicticus ibeanus*, Thomas, was originally based) persist at least for a considerable time after the general brownish tint has been developed. There is also a certain variation in size, but its extent is limited, and local averages can easily be made out. Although, therefore, the general character of a population (and the majority of specimens in a given locality) is well defined, yet the extremes overlap in neighbouring populations. There can be no doubt that these do not represent separate species, but mere local races of one species. Only four of them can be distinguished. Their external characters, if any exist, cannot yet be given with certainty, especially so as the material of *P. p. potto* and *P. p. faustus* is far too scanty. But the table of measurement (p. 250) gives a clear idea of the value of the races which are now accepted.

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* See also J. A. Allen, Bull. Am. Mus. N. H. xlvii. pp. 296–99 (1925).

### 1. *Perodicticus potto potto*, P. L. S. Müller *.

Syn. *guineensis* †, Desmarest; *geoffroyi*, Bennett ‡; *bosmannii*, Lesson.

*Type-locality.*—Elmina, Gold Coast.

*Specimens examined.*—6.

Axim Mines, S.W. Gold Coast (1, Brit. Mus.); Bibianaha, Gold Coast (1, Brit. Mus.); Dunkwa, Gold Coast (1, Brit. Mus.); Kumasi, Ashantee, Gold Coast (1, Brit. Mus.); Togo (1, Berlin Mus.); Iju Waterworks, near Lagos, S. Nigeria (1, Brit. Mus.)

*Distribution.*—Upper Guinea; extending to the River Niger on the east, western range coextensive with the rain-forest.

The material at hand is not sufficient to give the whole range of variation in this race, nor does it permit to define external racial characters. From the data at hand, however, it is evident that, as an average, it is the smallest of the races known, and clearly distinguished from *P. p. edwardsi.*

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* 1766. *Lemur Potto*, P. L. S. Müller, Linné, Natursyst., Suppl. p. 12 (ex Bosman).

1709. *Potto* or *Luyaerd*, Bosman, Beschryv. Guinese Goud-Tand-en Slavekust, ii. pp. 30–31, pl. (p. 29) fig. 4; described from a living specimen seen at Elmina in 1699.

† 1820. *Galago guineensis*, Desmarest, Mammal. p. 104 (nom. nov. pro *potto*).

‡ Type-locality: Sierra Leone; no type in existence, described from a living specimen.

### 2. *Perodicticus potto edwardsi*, Bouvier *.

Syn. *batesi*, de Winton; *ju-ju*, Thomas.

*Type-locality.*—North bank of River Congo. No type-specimen in existence.

*Specimens examined.*—44.

Nigeria: Abo, Lower Niger, Distr. Owerri (1, Berlin Mus ); Old Calabar (1, Berlin Mus.) ; E. Province, S. Nigeria (1, Brit. Mus.) ; " S. Nigeria" (1, Brit. Mus.)—type of *ju-ju*) ; Ikom, Upper Cross River, Distr. Ogoja (1, Brit. Mus.) ; Iki Shoko (1, Brit. Mus.) ; Victoria, Distr. S. Cameroons (4, Berlin Mus.) ; Mundame, Upper Mungo River, Distr. S. Cameroons (2, Berlin Mus.) ; Bambulua, Manenguba Mts., Distr. S. Cameroons (1, Berlin Mus.); Basho, Distr. S. Cameroons (1, Berlin Mus.).

French Cameroons: Bamatchem, Distr. Bamum (1, Berlin Mus.). Yaunde (4, Berlin Mus.) ; mouth of Lobo River, Upper Dscha River, Distr. Ebolowa (1, Berlin Mus.) ; Bitye, Upper Dscha River (2, Brit. Mus., incl. type of *batesi*) ; Dschapesten, Upper Dscha River (1, Berlin Mus.) ; Buar, east of Nana, Upper Sanga River, Distr. Uam-Pende (1, Berlin Mus.) ; Carnot, Upper Sanga River, Distr. Manbere-Lobaye (1, Berlin Mus.); Bipindi, east of Longji, Distr. Kribi (4, Berlin Mus.) ; Sangmelima, Distr. Ebolowa (1, Berlin Mus.) ; Ajos Hill near Kribi (1, Berlin Mus.) ; Alen, near N.E. border of Rio Muni (1, Berlin Mus.).

Rio Muni : Akonangi (1, Berlin Mus.) ; San Benito River (1, Brit. Mus.). Gaboon : Mfôa, 80 miles east of Gaboon (1, Brit. Mus.); Kiniati (probably Konkuati, Mayumbó Distr. (1, Brit. Mus.) ; no locality (8, Berlin Mus.).

*Distribution.*—Forest region between the Niger, Ubangi, and Congo Rivers, and the Lower Guinea Coast.

From the measurements given above it is evident that *batesi* and *ju-ju* come within the range of variation of *edwardsi*. A baby specimen in the Berlin Museum (no. 4186) from Old Calabar shows the silvery juvenile coat, but has the head already turning brown.

### 3. *Perodicticus potto faustus*, Thomas.

*Type-locality.*—Irneti, near Mompono, Maringa River, Distr. Lulonga, Belgian Congo.

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* 1879. *Perodicticus edwardsi*, A. Bouvier, "Guide du Naturaliste," Rev. Bibl. Sci. Nat. i p. 10. This reference has been kindly verified for me by Mr. F. Martin Duncan, of the Zoological Society, London.

*Specimens examined.*—2.

Irneti, near Mompono (1, Brit. Mus., type); Kunungu, near Bolobo, Distr. Bas Congo (1, Congo Mus.).

*Distribution.*—Forest region on left bank of the River Congo.

Except the two specimens examined the one from Mukimbungu, left bank of Lower Congo, described as *batesi*, but not measured by Lönnberg *, probably belongs to this race. As in the other races there appears to be the same variation in colour. The skin from Kunungu is bright cinnamon-brown, the long hairs being black, and the general effect therefore quite distinct from that of the type; unfortunately there is no skull. As regards the skull-measurements of the type, the greatest length is not comparable as the specimen is not fully adult; the canine-premolar-molar series comes within the ranges of *edwardsi* (near the lower end) and *ibeanus* (near the upper end); the molar series is within the range of variation of *edwardsi*, but it is very doubtful whether the size of the last molar in the type is a subspecific or, which is more probable, an extreme individual character. It would appear therefore that *P. p. faustus* is nearer *edwardsi* unless more material should prove the two to be identical, which, however, is less probable.

### 4. *Perodicticus potto ibeanus*, Thomas.

Syn. *arrhenii*, Lönnberg †.

*Type-locality.*—Kakumega Forest, N. Kavirondo, Uganda.

*Specimens examined.*—34.

Belgian Congo: Umangi, near Lisala, north bank of Congo, Distr. Bangala (1, Congo Mus.); Buta, Rubi River, Distr. Bas Uélé (7, Congo Mus.); Munza, east of Niangara, Distr. Haut Uélé (1, Berlin Mus., coll. G. Schweinfurth); Poko, Poko River, Distr. Haut Uélé (5, Congo Mus.; 1, Brit. Mus.); Djugu, south of Mahagi, Lake Albert, Distr. Ituri (1, Congo Mus.); Meje, Nawa River, Distr. Ituri (1, Congo Mus.); Penge, Ituri River, Distr. Ituri (1, Congo Mus.); Ituri River (1, Brit. Mus.); Beni, Semliki River, Distr. Ituri (1, Congo Mus.); Panga, Aruwimi River, Distr. Stanleyville (2, Congo Mus.); Bafwaboli, Tshopo River, Distr. Stanleyville (1, Congo Mus.); Stanleyville (2, Congo

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* K. Sv. Vet.-Ak. Handl. lviii. no. 2, p. 46 (1917).

† 1917. *Perodicticus arrhenii*, Lönnberg, K. Sv. Vet.-Ak. Handl. lviii. no. 2, p. 45 (Masisi).

Mus.); Zumlia, near Basoko, north bank of River Congo, Distr. Aruwimi (1, Congo Mus.); Masisi, west of Lake Kivu, Distr. Kivu (1, Congo Mus.); Baraka, N.W. Lake Tanganyika, Distr. Kivu (3, Congo Mus.; 1, Brit. Mus.); Lulindi River, east of Kasongo, Distr. Manyema (1, Berlin Mus.).

Uganda: Kakumega Forest (3, Brit. Mus., incl. *type*).

*Distribution.*—Forest region north and east of the River Congo and isolated forest strips from the River Ubangi in the west to the East African Rift in the east, the Mau Forest being the easternmost locality on record.

The specimens from the Congo forest have been referred to *faustus* by Thomas* and Allen †; but a comparison of the measurements of the Congo series, drawn from my own and Allen's material, with the tooth-measurements published by Hollister ‡ and those of the type of *ibeanus*, shows that the range of variation of the long series of specimens from the interior fully covers the variation of the smaller eastern lot. As regards *arrhenii*, the measurements of the type are also covered by the variation of *ibeanus*. Of four specimens in the Congo Museum, Tervueren, from Masisi (3187) and Baraka (878, 879, 880), determined as *P. arrhenii* by Prof. Lönnberg, no. 878 has the intermediate coloration with the hoary back, and agrees with the type of *ibeanus*; the other specimens are pale yellowish brown and all of practically the same shade; they also agree with specimens from Poko (no. 4327), Panga (8530), and Umangi (462); from all these localities various colour modifications are before me.

## ARCTOCEBUS, Gray.

Skull narrow, face broad. Premaxillary elongated into a tip. $P^2$ with cingulum at the posterior margin, but with the blade not distinctly set off. $P^3$ not reduced, with protocone, scarcely separated from $P^2$ and not from $P^4$. $P^4$, $M^1$, and $M^2$ with a distinct hypocone. Second and third finger reduced. Spinal process of cervical vertebræ reduced. No very young specimens are available; but in two half-grown skins of both *calabarensis* and *aureus* the hair-tips are yellowish white and the coloration of the back sharply set off from the head.

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* Ann. & Mag. Nat. Hist. (8) xvi. p. 467 (1915).

† Bull. Am. Mus. N. H. xlvii. p. 293 (1925).

‡ Bull. U.S. Nat. Must. xcix. p. 14 (1924).

### *Arctocebus calabarensis*, Smith.

Two local races.

A. Size larger. General colour pale cinnamon rusty; under surface whitish. Incisors normal ............................ *A c. calabarensis*, Smith.
B. Size smaller. General colour golden rusty; under surface light rusty. Incisors pin-shaped ............................ *A. c. aureus*, de Winton.

*Skull-measurements in the Subspecies of* Arctocebus calabarensis.

| Subspecies. | Greatest length. | | | Length of nasals. | | | Naso-cranial index *. | | | C–$M^3$. | | | $M^1$–$M^3$. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Av. | Max. | Min. | Av. | Max. | Min. | Av. | Max. | Min. | Av. | Max. | Min. | Av. |
| *calabarensis* . | 58·6 | 56·1 | 56·9 | 17·1 | 16·7 | 16·9 | 30 | 29 | 29·5 | 20·6 | 19·5 | 19·9 | 10·5 | 10·0 | 10·3 |
| *aureus*† .... | 54·2 | .. | .. | 13·1 | .. | .. | .. | 25 | .. | .. | .. | .. | 8·2 | .. | .. |

* The naso-cranial index as here understood is $\frac{\text{length of nasals}}{\text{greatest length}} \times 100$.

† Only one adult skull measured.

### *Arctocebus calabarensis calabarensis*, Smith.

*Type-locality.*—Old Calabar, Nigeria.

*Specimens examined.*—3.

Basho (1, Berlin Mus.); Yossplatte (1, Berlin Mus.), S.W. Cameroons; Cameroons (1, Berlin Mus.).

*Distribution.*—Region of Cameroon Mountain, extending in the north to the border of the forest. Probably extending east and west as far as the River Niger and Sanaga respectively.

*Skull-characters.*—Larger, with a longer face than *aureus*. Orbital rim not specially expanded, orbital width distinctly smaller than zygomatic. Interorbital portion of sagittal suture not developed as a crest. Premaxillary moderately elongated, the predental portion shorter than the breadth of the nasal opening, this latter not higher than broad. Incisors normal, about two-thirds the height of C, the median diastema narrower than the distance between the median roots of $I^2$* and C. $P^2$ and $P_3$ slightly projecting beyond $P^3$ and $P^4$ respectively. Cheek-teeth without cingulum at lateral margin.

*Arctocebus calabarensis aureus*, de Winton.

Syn. *ruficeps*, Thomas.

*Type-locality.*—San Benito River, 50 miles from mouth, Spanish Guinea.

Specimens examined.—5.

Cameroons: Nko, near Sangmelima, Distr. Elolowa (1, Berlin Mus) ; Metet, near Nyong River, Distr. Kribi (1, Brit. Mus., type of *ruficeps*).

Spanish Guinea: 50 miles up the San Benito River (1, Brit. Mus., *type*) ; Nkolentangan, south bank of Bim River, headwaters of San Benito River (1, Mus. Berlin) ; Alen, north bank of Bim River (1, Berlin Mus ).

*Distribution.*—Only recorded from the above localities, but presumably distributed in the region between the Ubangi, Congo, and Sanaga Rivers and the coast.

*Skull-characters.*—Smaller, with a short and slender snout. Orbital rims distinctly expanded ; orbital width subequal to zygomatic. Interorbital portion of sagittal suture distinctly developed as a crest. Premaxillary very long, its predental portion subequal to breadth of nasal opening ; this latter higher than broad. Incisors pin-shaped, about one-half the height of C, the median diastema much broader than the distance between the median roots of $I^2$ and C. $P^2$ and $P_3$ not projecting beyond $P^3$ and $P^4$. Cheek-teeth with cingulum at lateral margin.

*Arctocebus ruficeps*, Thomas, is doubtless a synonym of *aureus*. The differences in colour described are age-differences, and are paralleled by differences in specimens before me from the same general region. The presence or absence of a hypocone in $M^3$ is a character which varies individually in both *aureus* and *calabarensis*. In the three skulls of *calabarensis* in the Berlin Museum every stage between the two conditions can be seen. The only full-grown skull of *aureus*, from Alen, near the headwaters of the San Benito River, has the $M^3$ with a small but distinct hypocone ; the skin exhibits the uniform golden rusty tint of the adult.

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* In this genus, as in the African Galagos, the spurious *d* $I^1$ can usually be traced.

## XXXV.—*On the Dates of Publication and Contents of the Parts of Strecker (H.), ‘Lepidoptera etc.,’* 1872–1900. By FRANCIS J. GRIFFIN, A.L.A., Registrar, Entomological Society of London.

IN view of the fact that copies of this book are becoming harder to obtain, and especially since the wrappers of the parts are already very rare, I consider it desirable to record the following information for the use of Lepidopterists:—

STRECKER (HERMAN).

‘Lepidoptera, Rhopaloceres and Heteroceres, indigenous and exotic; with Descriptions and Coloured Illustrations,’ by Herman Strecker.
Pp. 143, 15 pls. col. 4to. Reading, Pa., 1872–1877.
——. Supplement No. 1.
Pp. 1–15. 4to. Reading, Pa., 1898.
——. Supplement No. 2.
Pp. 1–11. 4to. Reading, Pa., 1899.
Supplement No. 3.
Pp. 13–37. 4to. Reading, Pa., 1900.

The contents and dates of issue (as given on the wrappers) of the 15 parts of the work proper are:—

No. 1. T.P., Advt. 1 p.; *Platysamia gloveri*, sp. n., 2 pp.; Notes relative to some Varieties of Lepidoptera, 1 p., 1 pl. Jan. 1, 1872.
2. Pp. 9–15, pl. ii. April 1873.
3. Pp. 17–24, pl. iii. May 1873.
4. Pp. 25–32, pl. iiii. June 1873.
5. Pp. 33–43, pl. v. July 1873.
[MS. note on a copy for sale at Messrs. Wheldon & Wesley, “Rec’d. Oct. 9, 1873.”]
6. Pp. 45–50, pl. vi. August 1873.
[MS. note, “Rec’d. Oct. 28, 1873.”]
7. Pp. 51–60, pl. vii. September 1873.
[MS. note, “Rec’d. Dec. 31, 1873.”]
8. Pp. 61–70, pl. viii. 1874.
9. Pp. 71–80, pl. ix. 1874.
[On p. 73 is the date “Mar. 1st, 1874,” and on p. 80 is “Mar. 17th, 1874.”]
10. Pp. 81–94, pl. x. 1874.
[On p. 94 is the date “May 1874.”]
11. Pp. 95–100, pl. xi. 1874.
[MS. note, “Rec’d. Jan. 10, 1875.” On p. 100 is the date “August 1874.”]
12. Pp. 101–108, pl. xii. 1875.
[On p. 108 is the date “Feb. 22, 1875.” On the front wrapper is printed “Issued Quarterly at 50 Cents per Part.”]
13. Pp. 109–123, pl. xiii. 1876.
[MS. note, “Rec’d. Mar. 9, 1876.” On p. 123 is the date “Jan. 1876.”]

14. Pp. 125–134, pl. xiv. 1877.
[On p. 132 is the date "September 1877"]
15. Pp. 135–143, pl. xv. 1877.
[On p. 143 is the date "November 1877."]
Supplement No. 1. Pp. 1–12. 1898.
[Brit. Mus. (Nat. Hist.) copy dated with stamp "15 Dec. 1898."]
Supplement No. 2. Pp. 1–11. 1899.
Supplement No. 3. Pp. 13–37. 1900.
[Preface dated "Mar. 9, 1900," Brit. Mus. (Nat. Hist.) copy received "16 Feb. 1901," but as Suppl. No. 2 was also received on that date this would not appear to signify.]

A complete copy of the work with the wrappers is in the Library of the British Museum (Natural History), and a similar copy is now (17.vi.1931) on sale at Messrs. Wheldon & Wesleys, to whom I am indebted for the loan of it.

## XXXVI.—*The Egg-laying Process of the Gastropod* Alectrion fossatus, *Gould*. By G. E. MacGinitie, Hopkins Marine Station of Stanford University.

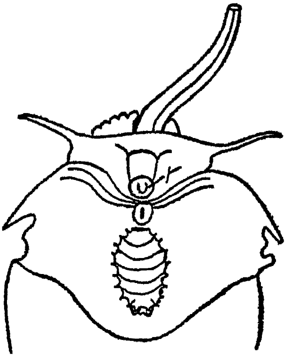
*Alectrion fossatus* proceeds about its egg-laying in the following manner:—

The surface upon which the eggs are to be laid is investigated by the end of the siphon, which serves as the main exploring organ. If the region proves satisfactory, the anterior edge of the foot is drawn backward, and the radula-sheath is everted. Then with its radula the animal cleans a spot where the egg-capsule will be attached (see fig. 1). The cleaning operation is performed by about fifteen forward strokes of the radula over an area approximating ½ square centimetre.

When this is finished, a fold is thrown in the right portion of the foot, which forms a tube connecting the genital pore and the pedal gland (see fig. 2). Through this tube a fluid egg-mass passes, and is taken into the pedal gland. The lip or peristome of the pedal gland is now firmly pressed against the surface where the egg-capsule is to be attached, and is held there for a period of time which is always very close to 9½ minutes (see fig. 3).

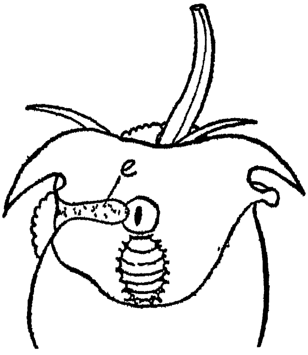
As soon as the eggs enter the pedal gland and the infolded tube disappears, the median part of the foot is raised posterior to the pedal gland, and a fold is held in both sides of the foot about in line laterally with this gland. This forms a water-chamber with an inlet and outlet through which a constant, though quite slow, flow of water is maintained, no doubt for aeration of the capsules already attached (see arrows, fig. 3). During this 9½-minute attachment-interval, the body of the snail and the shell are slowly oscillating from side to side. Whether this maintains the current of water or whether it has something to do with the workings of the pedal gland is not at present clear. The former seems more probable, as the movement of the foot, though not perceptible, would be increased directly with the distance dorsad. It may even be due to heart-beat.

Fig. 1.



Cleaning an area with radula for attachment of next capsule.
*r.*, radula.

Fig. 2.

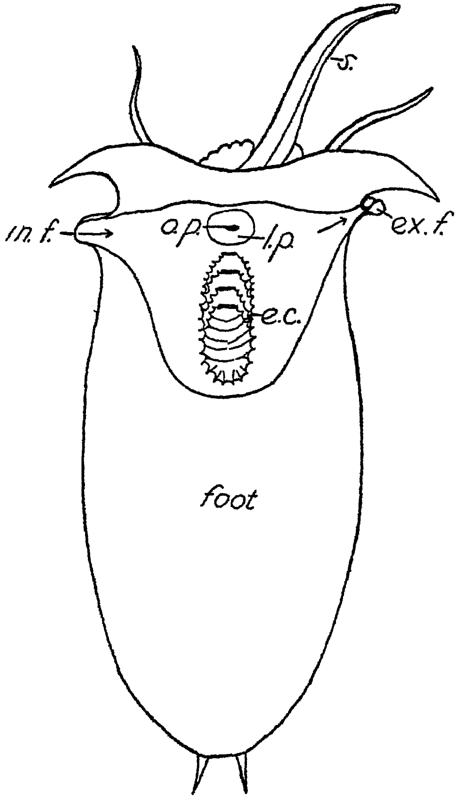


Passing of egg-mass *e* from oviduct to pedal gland.

At the end of 9½ minutes the anterior end of the foot is lifted upward and backward, and, as the capsule is now cemented to the object upon which it is being attached, it pulls out of the pedal gland as a completed egg-capsule.

A new area is now cleaned just ahead of the attached capsule and the entire operation repeated.

Fig. 3.



Attaching capsule.

*e.c.*, egg-capsules; *ex.f.*, excurrent fold of foot; *in.f.*, incurrent fold; *l.*, lip or peristome of pedal gland; *s.*, siphon.

Each egg-capsule consumes 12½ minutes of time, and a string containing forty-five capsules has been found, which, therefore, represents 9 hours for the entire string.

The average capsule measures 3·8 × 5·5 mm., including points, and is 1·1 mm. thick. It is somewhat concave posteriorly and convex anteriorly as it leaves the pedal gland;

and never entirely loses this shape, though the concavity becomes less and less during the incubation period. The margin is flattened, and is bordered on either side by rows of points. The anterior face is also somewhat covered with points, which are arranged on six or seven transverse ridges, the ridges becoming more plentiful near the attached end. The capsules are attached in imbricated rows, the base of one being continuous with the base of the next, so that the entire string may be graphically represented by fig. 4.

Fig. 4.

Diagram of string of capsules.

A row of thirty-one capsules measured 38 mm., another of forty-five capsules measured 65 mm. A space of about 1⅓ mm. is, therefore, required by each capsule in a string.

As will be seen from the above account, the pedal gland of *Alectrion fossatus* serves a purpose other than that of "lubricating the foot."

Pacific Grove, California.

## XXXVII.—*Some Brevicipitid Frogs from Tanganyika Territory.* By H. W. Parker, B.A.

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In addition to the widespread *Breviceps mossambicus*, Peters, there are in Tanganyika Territory a number of other superficially similar frogs concerning whose generic status there is some confusion. The first to be recorded was referred to the genus *Breviceps*, and was at first confused with *B. verrucosus*; subsequently it received the name *B. macrodactylus*, Nieden. The next species to be discovered was described as *B. uluguruensis*, Loveridge, but Power[*], in his revision of the genus *Breviceps*, refused to admit the species, without, however, making any suggestion as to its true status. The only subsequent commentators, Barbour and Loveridge[†], refused to accept Power's opinion, and reinstated the species in *Breviceps*.

Examination of a series of specimens of the known species makes it clear that they form a distinct group, differing from

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[*] Ann. S. Afr. Mus. xx. 6, 1926, p. 452.

[†] Mem. Mus. Comp. Zool. Harvard, L. 2, 1928, p. 247.

*Breviceps* (sensu stricto) in the absence of the glandular area on the roof of the mouth, which is so characteristic of that genus. In addition they are less stout in habitus, with longer narrower heads, without any marked digital reduction, and with much longer limbs. In all these characters they approximate to *Spelæophryne*, Ahl, and their inclusion in a separate genus seems desirable.

## PROBREVICEPS, gen. nov.

*Breviceps* (non Merrem), Tornier, Kriechthiere Deutsch O.-Afr. iii. 4, p. 160 (1906).
*Breviceps* (part.), Nieden, 'Das Tierreich,' Anura, ii. p. 4 (1926); Loveridge, Proc. Zool. Soc. London, 1930, p. 15.

Pupil horizontal. Tongue large, subcircular, with a median furrow; scarcely free behind. A denticulated dermal ridge across the palate in front of the pharynx, preceded by a similar narrow strongly curved one; a dermal papilla between the internal nares. Digits not dilated; toes free; outer metatarsals united.

No maxillary or vomerine teeth. Clavicles and procoracoids present; coracoids moderately dilated; omosternum small, cartilaginous; sternum cartilaginous. Sacral diapophyses strongly dilated; coccyx and sacrum fused. Terminal phalanges simple.

Genotype, *P. macrodactylus*, Nieden.

### *Synopsis of the Species.*

| | |
|---|---|
| I. Tympanum visible; tibio-tarsal articulation reaching the shoulder or beyond. | |
| A. Tympanum $\frac{2}{3}$ the diameter of the eye . | 1. *P. macrodactylus macrodactylus* (Nieden). |
| B. Tympanum $\frac{1}{2}$ the diameter of the eye . | 2. *P. macrodactylus loveridgei*, subsp. n. |
| II. Tympanum hidden; tibio-tarsal articulation reaching the elbow or the shoulder. | 3. *P. uluguruensis* (Loveridge). |

### (1) *Probreviceps macrodactylus macrodactylus* (Nieden).

*Breviceps verrucosus* (non Rapp.), Tornier, Kriechthiere Deutsch O.-Afr. iii. 4, p. 160 (1906); Nieden, Sitzber. Ges. Nat. Fr. Berlin, x. p. 449 (1910); id. Mitt. Zool. Mus. Berlin, vii. p. 300 (1915.)
*Breviceps macrodactylus*, Nieden, 'Das Tierreich,' Anura, ii. p. 6 (1926).
*Breviceps usambaricus*, Barbour & Loveridge, Mem. Mus. Comp. Zool. Harvard, L. 2, p. 251 (1928); Loveridge, Proc. Zool. Soc. London, 1930, p. 16.

Snout moderately pointed, slightly prominent, as long as the diameter of the eye; canthus rostralis rounded; loreal region nearly vertical, very slightly concave; interorbital space about once and a third as broad as the upper eyelid;

tympanum distinct though sometimes ill-defined, about $\frac{2}{3}$ the diameter of the eye. First finger shorter than the second, which is a little longer, or a little shorter, than the fourth. Toes moderate, the fourth very long; outer much shorter than the third but extending well beyond the second. Subarticular tubercles well developed; a large oval inner and an ill-defined flat outer metatarsal tubercle. Tibio-tarsal articulation reaching to between the shoulder and the tympanum. Skin rugose or granular above, smooth or slightly granular beneath.

Uniform dark purplish brown above, pale brown beneath, with numerous small, round, whitish spots; throat dark, light dotted.

Length from snout to vent 65 mm.

*Distribution.*—Usambara Mountains, Tanganyika Territory, from 3000–4000 ft.

Types (Berlin Mus. 11362) examined, and 11 other specimens, including a paratype of *B. usambaricus*, Barbour & Loveridge.

### (2) *Probreviceps macrodactylus loveridgei*, subsp. n.

*Breviceps rugosus* (non Power), Barbour & Loveridge, *tom. cit.* p. 249 (1928); Loveridge, *loc. cit.* (in part.).

Holotype, a female, number 1928.5.1.8 in the British Museum, from Bagilo, Uluguru Mts., Tanganyika Territory; collected by A. Loveridge, Esq.

Snout moderately pointed, slightly prominent, as long as the diameter of the eye; canthus rostralis distinct; loreal region nearly vertical, concave; interorbital space about as broad as the upper eyelid; tympanum distinct, its diameter about half the length of the eye. First finger a little shorter than the second, which is about as long as the fourth. Toes moderate, the fourth very long; outer much shorter than the third, but extending beyond the second. Subarticular tubercles well developed; a flat oval inner and a rounded outer metatarsal tubercle. Tibio-tarsal articulation reaching the tympanum. Skin beset with numerous small subconical warts above; uniformly granular beneath.

Uniform purplish brown above; brown beneath, with a faint darker reticulum.

Length from snout to vent 41 mm.

Paratypes:—A male, number 1930.10.3.1 in the Brit. Mus., and eight males and females, numbers 15701–15708 in the Mus. Comp. Zool. Harvard, from Vituri, Uluguru Mountains; a female from Bagilo, Uluguru Mts., in the McGregor Mem. Mus., Kimberley.

These specimens do not differ appreciably from the holotype. The outer finger may be a little longer or a little shorter than the second, the tympanum may rarely be partially concealed, the tibio-tarsal articulation may reach the eye, and the largest specimens are: ♂ 34 mm.; ♀ 45 mm.

The eggs are large (6 mm. including the transparent jelly) and are laid in burrows; development is presumably direct and similar to that of *Breviceps.*

Barbour and Loveridge originally referred these specimens to *Breviceps rugosus*, Power (on the faith of a determination by Power), but pointed out a number of differences. Comparison with the type of Power's species reveals a certain superficial resemblance between the two, but whereas *B. rugosus* has the swollen glandular palate of a normal *Breviceps*, the Uluguru frogs are congeneric with *Probreviceps macrodactylus.* The differences from the latter species do not appear to be of specific importance, but since the Usambara Mountain form is almost constantly distinctly larger, the two are probably racially distinct.

### (3) *Probreviceps uluguruensis* (Loveridge).

*Breviceps uluguruensis*, Loveridge, Proc. Zool. Soc. London, 1925, p. 789, pl. i. fig. 3; *id. op. cit.* 1930, p. 16; Barbour & Loveridge, *tom. cit.* (1928).

Snout short, moderately pointed and slightly prominent, a little shorter than the eye; canthus rostralis rounded; loreal region slightly oblique; interorbital space as broad as the upper eyelid; chin swollen. First finger shorter than the second, which is as long as or a little shorter than the fourth. Toes moderate, the fourth long and slender; outer shorter than the third, but extending well beyond the second. Subarticular tubercles moderate; an oval pebble-like inner and an indistinct outer metatarsal tubercle. Tibio-tarsal articulation reaching the elbow or the shoulder. Upper surfaces with small warts; lower surfaces granular.

Cream to terra-cotta coloured above, sometimes washed with purple. Flanks and lower surfaces purplish brown, with some indistinct lighter blotches.

Length from snout to vent 42 mm.

*Distribution.*—Uluguru Mts., Tanganyika Territory, from 6000–8000 ft.

The eggs are large (5·5 mm.) and laid in burrows like those of *P. macrodactylus loveridgei.*

Sixteen specimens (including fifteen paratypes) examined.

## XXXVIII.—*Some African Bees of the Genus* Nomia.

By T. D. A. Cockerell, University of Colorado.

The bees now reported on were received from the Imperial Institute of Entomology, through Sir Guy Marshall. All the species, including the holotypes, are being deposited in the British Museum. Meade-Waldo in 1916 published a key to the Ethiopian *Nomia* in the British Museum, but it included only 21 species. Some years later, when I visited the Museum, I found 41 named species (including those of Madagascar), and no less than 64 undetermined. Up to the present time about 235 species and varieties of Ethiopian *Nomia* have been named; of these I have 51 in my collection. Last summer I visited the Congo Museum at Tervueren and the Paris Museum, and was able to examine many types, especially of species described by Vachal and Strand. There are, however, many species I have not seen, and the descriptions often appear more or less inadequate. In some cases they are based on poor material, which would be hard to recognize with the specimens actually in hand*. *Nomia* in the Ethiopian region has much the same position as *Andrena* in the Palæarctic, but is presumably even richer in species, owing to the great diversity of physical conditions and flora. It is not improbable that 1500 or 2000 species and races actually exist, and most of them seem to be of limited distribution. In some cases a very wide distribution is recorded, and as in other large genera there are apparently species which have spread over an immense territory. All such cases, however, should be critically examined, as it is easy to confuse similar but actually distinct forms. In the Australian fauna I found *Nomia* especially prone to produce races or subspecies, which are recognizable, but so closely allied that it is convenient to group them under a certain number of specific names. The same condition probably exists in Africa, but it has not been sufficiently elucidated.

The question naturally arises whether such a large genus should not be subdivided. I have definitely separated

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* The worst case of this kind I encountered was in another genus. *Lithurgus acanthurus*, Vachal, is based on two specimens in the Congo Museum, in the most miserable condition. The mesothorax is dull, and in the female only very weakly and inconspicuously transversely sculptured (in *L. sparganotes* it is conspicuously sculptured, and glistening). There is a slightly elevated, transverse, shining supraclypeal ridge, and the ventral scopa is dark rufo-fuscous. The male has long curved hind basitarsi. This species cannot be clearly understood until good topotypical material is obtained.

*Crocisaspidia* and *Meganomia*, and no doubt other valid segregates will be found when the species are better known. *Steganomus*, recognized by the antennæ, has included several species which may not be especially allied. *Stictonomia*, with the male scutellum spined, seems to contain diverse elements. *Macronomia* was founded on an isolated species from S. Africa. *Pseudapis*, described by W. F. Kirby as a wasp, is peculiar for the very large tegulæ (but many other *Nomia* have the same), and the middle tarsi at end with a fan-like brush, or pair of tufts, of black hair, just as in some males of *Anthophora*. It is extraordinary to see this distinctive character arising in two groups so distantly related. *Nomiapis*, based on the Palæarctic *N. diversipes*, has very large tegulæ, curious laminate tubercles, a backwardly directed tooth at each side of scutellum in male, and no hind spurs. It differs from *Stictonomia* in the matter of the tubercles and spurs, and is a more advanced or differentiated type. Meade-Waldo pointed out that the Oriental group *Hoplonomia*, with bispinose postscutellum, reaches Madagascar (*N. cuneata*, Sauss.)—a matter of great interest from the standpoint of geographical distribution.

### *Nomia chlorozona*, sp. n.

♂.—Length about 11 mm., anterior wing 8 mm.

Black, the vertex and thoracic dorsum thickly covered with rather long fulvous hair; tergites 1 to 6 with emerald-green marginal bands, the first rather narrow, the next four broad, the sixth broad in middle but narrowed and failing at sides; tongue long and slender, with long fulvous hair; eyes light purplish; orbits converging below; face, cheeks, and sides of thorax covered with pale yellowish-tinted hair; mandibles shining black; clypeus dull, excessively densely punctured, with no trace of a median keel; third antennal joint less than half length of fourth; scape and second joint black, flagellum bright ferruginous beneath, but dusky above; mesothorax and scutellum entirely dull, scutellum and post-scutellum simple; area of metathorax not distinctly defined, posterior face of metathorax with a shining space in middle; tegulæ dull pale fulvous, enlarged and elongate, but narrowed behind. Wings reddish hyaline; stigma very small, dull ferruginous; nervures pale brown; basal nervure falling a little short of nervulus; second cubital cell square, receiving recurrent nervure toward end; third cubital cell very long; twelve hooks on hind wing. Legs black, with pale greyish, slightly yellowish, hair; tarsi, and tibiæ at apex, brownish; hind femora broadly flattened beneath, but hardly enlarged; hind tibiæ very broad, flattened-trigonal, broadly light ferruginous apically, especially on outer side, the inner apical corner swollen, convex and shining, the anterior spur bent at end ; hind basitarsi on inner side with pale fulvous hair. Abdomen dull, finely punctured, with pale pubescence, black on discs of tergites 3 to 6 ; green tegumentary bands, but no hair-bands ; apex, seen from above, appearing broadly emarginate or bilobed ; hair at sides of apical region pale brownish grey.

Sudan : Nuer District, 7. ix. 23 (*V. H. Fergsson*, C. 4875).

This cannot be the male of *N. viridicincta* by the hair of thorax above pale fulvous, with no dark intermixed, the stigma shorter, venation paler, second cubital cell receiving recurrent nervure not far from end, abdomen dull, and bands broader. It is not *N. madibirensis*, Friese, which has (male) the scape yellow in front and the tarsi yellow.

*N. viridicincta*, Meade-Waldo, I recognize in a female from Kampala, Uganda, Sept. 23, 1915 (*C. C. Gowdey*, 5070).

In addition to the three green-banded *Nomia* now known from the African mainland, there is a very remarkable species, *N. viridilimbata*, Sauss., found in Madagascar. This I examined in the Paris Museum, and noted : flagellum bright ferruginous beneath, scape with a yellow stripe ; hind femora very thick, with a tooth below ; hind tibiæ greatly produced in front, light yellow, with a large black basal patch ; tergites 1 to 5 with rather narrow pale green bands ; at each side of base of sixth segment beneath is an outstanding broadly truncate rufo-testaceous lamella.

### *Nomia notabilis*, Schletterer.

Natal : Weenen, 2840 ft., Jan.-Feb. 1924 (*H. P. Thomasset*).

### *Nomia megapoda*, sp. n.

♂.—Length about 13 mm., anterior wing 12·4.

Black, with the hair of face, cheeks, and sides of thorax pale, slightly yellowish, of thorax above, including tubercles, dull ferruginous, short, and thin on disc ; head rather small and narrow, eyes narrow, very dark brown ; mandibles black ; antennæ black, the long slender flagellum faintly brownish beneath ; vertex behind ocelli with a longitudinal sulcus, and on each side a broad shining depression ; mesothorax dull and densely punctured, the median sulcus strong ; scutellum unarmed, bigibbous, the elevations shining in front ; base of metathorax dull and granular, without any transverse channel, but posterior face very deeply sulcate in middle, and swollen and shining on each side of the sulcation ; tegulæ light ferruginous, somewhat elongate, but hardly enlarged. Wings reddish hyaline, with very conspicuous dark outer margins; basal nervure meeting nervulus; second cubital cell square, receiving recurrent nervure in middle; marginal cell very long. Legs ferruginous except at extreme base, but anterior femora black above, middle femora suffused with black above, middle tibiæ with a large black patch behind; hind femora very bright ferruginous, enormous, obtusely humped, trigonal in lateral view, on the outer inferior margin near the middle with a sharp tooth; hind tibiæ stout, strongly curved, with a very broad yellowish or pale testaceous apical lamella, obliquely truncate (but not bidentate) and pointed at end; middle tarsi long and slender. Abdomen black, the apical depressions of the tergites pale, more or less reddish, translucent; no hair-bands, except at extreme sides, where they are thin and pale fulvous, not conspicuous; first tergite dull, second somewhat shining, the others shining, without evident punctures; extreme sides rufescent; apex emarginate.

Kenya Colony: near Kericho, May 1920 (*F. W. Dry*); two specimens.

Closely allied to *N. picardi*, Gribodo, which I examined in the Paris Museum. In *N. picardi* the lobe of the hind tibia is very strongly bidentate; but it has, like our species, remarkable swollen bright ferruginous hind femora. The tegulæ of *N. picardi* are rather large, red; the mesothorax is dull, minutely and closely punctured. Another related species, of which I examined the type, is *N. fimbriata*, Vachal. It is a large male *Nomia* with clear red legs; wings yellowish hyaline with broad dark margin; abdomen reddish, tergites 2 to 5 with broad bands of dense cream-coloured tomentum; hind tibiæ with anterior apex smooth (not hairy like rest of tibia), rather elevated, but not produced or bifid; hind femora strongly gibbous above; face with clear white hair; basal nervure exactly meeting nervulus (falling short of it in *N. picardi*).

### *Nomia amœnula*, Gerstaecker.

Uganda: Namunage, March 1, 1909, ♀ (*C. C. Gowdey*).

Zanzibar: Pemba Is., Sept. 15–23, 1924, ♀, and Nazi Moja, Aug.–Dec., 1924 (*H. J. Snell*).

### *Nomia leucophora*, sp. n.

♂ (type).—Length about 11 mm., anterior wing 8.

Black, with tergites 2 to 5 with broad marginal pure white tegumentary bands, hind tibiæ (except at base) and basitarsi bright ferruginous, all tarsi red at extreme tip; face, cheeks, and sides of thorax with long shaggy dull white hair, but thorax above with erect pale fulvous hair; tongue rather long, slender; antennæ black, flagellum very obscurely brownish beneath, apical joint somewhat but not acutely pointed; head broad; mesothorax and scutellum (which is not tuberculate) entirely dull, punctures not evident under a lens; area of metathorax triangular, basal part finely rugose, without a channel; hind face of metathorax punctured and somewhat shining; tegulæ oval, rather large, whitish, with a dark brown spot posteriorly. Wings hyaline, the outer margin faintly dusky; stigma small, ferruginous; nervures fuscous, basal nervure meeting nervulus; second cubital cell small, broader above than below, first recurrent nervure meeting intercubitus. Legs with whitish hair, pale fulvous on inner side of tarsi; hind femora very greatly swollen and humped, trigonal in lateral view; hind tibiæ short and very thick, with only a moderate rounded apical lobe. Abdomen dullish, rugoso-punctate, first tergite with long whitish hair, second to fourth with erect pale fulvous hair, only evident in lateral view; apex bilobed.

♀.—Similar in appearance; abdomen with three white bands, the fifth tergite with a pale, slightly fulvous, fringe; posterior face of metathorax shining, in strong contrast with the basal area; hind tibiæ and basitarsi clear red, with pale red scopa.

Cape Province: Lady Grey, Dec. 8 to 17, 1924 (*R. J. Nel*).

Recalls the smaller (9 mm.) *N. whiteana*, Cam., from Grahamstown, which has four white bands on the female abdomen and five on the male; also *N. peteria* (Strand), which is still smaller (♀ 7·5 mm.), with three pale yellowish bands. There is a curious superficial resemblance to *Halictus albofasciatus*, Smith.

## *Nomia nudiventris*, Friese.

I have an authentic specimen from Friese, and find that my *N. pyrura* is a synonym.

## *Nomia neli*, sp. n.

♀.—Length about 11 mm., anterior wing 8·5.

Rather robust, black, including mandibles, antennæ, and legs, but first tergite at apex and base of second (the latter very broadly at sides) bright ferruginous; tergites 2 to 5 with broad pallid (more or less coppery red, shading into yellowish white apically) hind margins, thinly covered with short pale hair; tergites 3 to 5 with narrow dull whitish hair-bands at extreme base; fifth and sixth tergites black, with scanty dark hair, some pale at extreme sides; head and sides of thorax with rather long, thin, greyish-white hair, but thorax above with pale fulvous hair and dark hair intermixed; clypeus entirely dull, a very narrow shining line along lower edge of supraclypeal area; scape long; flagellum appearing black, but obscurely rufous beneath; mesothorax and the quite unmodified scutellum wholly dull; area of metathorax small, with a narrow shining line along the base; tegulæ oval, somewhat enlarged, posteriorly shining black, anteriorly with a very broad whitish margin. Wings dusky, the outer margin not conspicuously darker; stigma dark ferruginous, nervures brown, basal nervure meeting nervulus, second cubital cell small, about square, receiving recurrent nervure beyond middle. Scopa of hind tibiæ white; hind basitarsi broad and hairy. Abdomen dullish, venter with rufous hair-bands.

Cape Province: Lady Grey, Dec. 9, 1924 (*R. J. Nel*).

Not in my collection, nor in the tables of Strand and Meade-Waldo. I find no description of a very similar species, but there is a strong superficial resemblance to the group of *N. vulpina*, Gerst., from which it is easily known by the colour of the abdomen.

### *Nomia patellifera*, Westwood.

Nyasaland: Chiromo, ♂ (*R. C. Wood*).

### *Nomia tridentata*, Smith.

Brit. E. Africa: Kabete, 6000 ft., Apl. 12, 1918 (*T. J. Anderson*).

### *Nomia aurifrons* (Smith).

This name for an African species, though described in the wrong genus, takes precedence over *N. aurifrons*, Smith, for an Indian species. The supposed male of the Indian species is *N. silhetica*, Westw. (*cf.* Ann. & Mag. N. H., Aug. 1920, p. 206), but it is not certain that it belongs here. If it does not, the name *N. andrenina*, Ckll., which has been placed in the synonymy of *N. aurifrons*, may be available; *N. andrenina* is certainly distinct from *N. silhetica*.

### *Nomia aureotecta*, sp. n.

♀.—Length about 13 mm., anterior wing 11·5.

Robust, black, including mandibles and antennæ, the flagellum short and very thick; hair of thorax throughout rather short and stiff, yellowish fulvous; face very broad, eyes converging below; tongue slender, not very long; clypeus dull and densely rugoso-punctate, depressed in middle;

supraclypeal area and sides of face also dull; vertex densely rugose; mesothorax and scutellum dull and minutely roughened, the covering of hair not hiding the surface; posterior face of metathorax dull, with excessively dense minute punctures, but basal area with a shining transverse channel, linear at sides, broad in middle, with transverse keel at intervals, bounding square spaces; tegulæ oval, clear ferruginous. Wings hyaline, slightly yellowish, with a very broad dark outer margin; stigma and most of the nervures light ferruginous; basal nervure falling a little short of nervulus; second cubital cell extremely broad, receiving recurrent nervure at about the end of the third fifth. Legs with pale fulvous hair; tibiæ and tarsi ferruginous, the mid-tibiæ with a black mark on outer side near base; hind basitarsi very broad, with a coppery apical fringe; second joint of hind tarsi swollen laterally. Abdomen broad, dullish, excessively minutely and densely punctured, hind margin of first tergite narrowly reddened, of the other pallescent; broad dense fulvous hair-bands on tergites 3 to 5 (very broad and more coppery on 5); on second tergite the band is narrowed and interrupted in middle, on first it is reduced to cuneiform lateral marks; venter with rich red hair-bands.

Cape Province: Lady Grey, Jan. 6, 1925 (*R. J. Nel*).

This species is closely allied to *N. schoutedeni*, Strand (Belgian Congo), the type of which I saw in the Congo Museum. I noted: female: medium size; orbits converging below; face and front densely covered with pale, slightly fulvous hair; thorax above with clear red hair; tegulæ moderate, bright ferruginous, with a shining boss; second cubital cell extremely broad, receiving recurrent nervure not far from end; hind basitarsi very broad; second joint of hind tarsi produced; abdomen with broad rufo-fulvous bands, covered with appressed hair, on tergites 2 to 4; tergite 1 with traces of bands at sides; hair of hind tibia dull white. It is also rather close to *N. perornata*, Ckll., but quite distinct.

I had to consider whether *N. aureotecta* could possibly be the undescribed female of *N. grossiventris*, Friese, but that has brown tegulæ, and the type is from Kilimandjaro, though a bad specimen from the Transvaal was referred to the same species.

### *Nomia cinerea*, Friese, 1930.

Cape Province, Brandvlei, Dec. 5, 1928 (*J. C. Faure*); 6 ♂, 1 ♀.

The males agree with Friese's description. The female is new; it is about 8 mm long; black, with the hind tibiæ and tarsi chestnut-red, as also the anterior tibiæ in front, and the small joints of anterior and middle tarsi; pubescence white, fulvous on inner side of tarsi; flagellum obscurely reddened beneath; wings clear, stigma reddish fulvous; basal nervure very strongly bent, meeting nervulus; second cubital cell somewhat higher than broad; first recurrent nervure meeting intercubitus; head large, face very broad; mandibles dark red, with black base; clypeus dullish, densely punctured, with a large transverse depression at apical middle; mesothorax polished, with scattered punctures; scutellum unarmed (spined in male); area of metathorax beyond the base highly polished; fifth tergite densely fringed with fulvous hair. Related to *N. megalepis*, Ckll., but easily distinguished by the broader head and polished space on metathorax.

Friese suggests that his *N. albidula* may be the female of *N. cinerea*, but this is not at all the case.

### *Nomia ablusa*, sp. n.

♂.—Length about 10·5 mm., anterior wing 8·7.

Moderately robust, with the aspect of a female, the entirely black antennæ comparatively short; first three tergites light fulvo-ferruginous at base, the first broadly black apically in middle, but the black rapidly narrowing at each side, ending in a point below the lateral margin; second tergite with a similar but broader black band, also ending sharply at sides; third red at sides and at extreme base behind the margin of the second; in addition, the hind margins of the tergites are broadly translucent, of the first and second tergites appearing red, because of the red base of the following tergite showing through; the third and following tergites have conspicuous dull white hair-bands, but the second has only a sparse fringe of hairs, and the first some hair at sides; head and thorax with shining greyish-white hair, thin on mesothorax; mandibles black; clypeus with a dull surface; vertex entirely dull, except a shining spot next to lateral ocelli; mesothorax glistening but closely punctured, with three parallel lines anteriorly; scutellum hairy, not spined or tuberculate; metathorax very hairy, except the small triangular enclosure, which is glistening and has weak plicæ; mesopleura densely hairy; tegulæ small, with testaceous boss and hyaline margin. Wings hyaline, the outer margin broadly pale brown, but no distinct apical spot; basal nervure curved at lower end, falling short of nervulus; stigma very dark reddish; second cubital cell about square, receiving recurrent nervure a little before middle. Legs black, the small joints of tarsi, and hind basitarsi, brown; hind femora swollen, with a strong, sharp, oblique dark red tooth beneath beyond middle; hind tibiæ broad at apex, but otherwise ordinary. Abdomen dullish, the black parts finely rugulose; venter ferruginous except apically; fifth sternite with a pair of shining pyriform spaces, narrowly separated.

Kenya Colony: Trans-Nzoia, May 10, 1919 (*T. J. Anderson*).

In Strand's table it runs nearest to *N. stylopicata*, Strand, but that is quite a different species, with simple hind legs. The hind femora resemble in structure those of *N. picardii*, Gribodo, but are less swollen, and the insect is much smaller.

### *Nomia murinella*, Cockerell.

Natal: Weenen, Nov. 1927 (*H. P. Thomasset*); male.

This was described from the female; the male is closely similar. Hair of face and upper part of thorax fulvous, but pale and dull, contrasting with the greyish-white of cheeks and sides of thorax; antennæ short for a male; hind femora swollen, entirely black, with long hair, not spined beneath; hind tibiæ black, stout, strongly curved, with a large wedge-shaped brown lamella at end; hind tarsi entirely dark; fourth sternite pallid and broadly emarginate.

A female from the same locality and collector is dated March–April 1924. There are two other males which appeared so different that I at first regarded them as different species, but they are structurally similar, except for the fact that they have a pair of conspicuous bosses on the clypeus. It seems best to set them forth as varieties:—

### *Nomia murinella*, var. *absona*, nov.

Male about 6·5 long.

Hind legs black, the tarsi red at extreme tip; hair of face and mesothorax dull white like that of other parts of head and thorax, but scutellum with much dark brown hair; tegumentary bands of abdomen not evidently reduced to narrow hyaline margins on tergites 2 and 3, broader but inconspicuous on those following.

Weenen, March–April 1924.

### *Nomia murinella*, var. *abjuncta*, nov.

Male about 7·2 mm. long.

Hind femora bright ferruginous beneath, with a dark stain in middle; all the tarsi bright ferruginous apically, anterior basitarsi red at extreme base; hair of face white, of thorax above faintly yellowish, especially on scutellum.

Weenen, Nov. 1927.

The hind trochanters of all these males are produced to a point. The scutellum is unarmed. The tegulæ are brown or piceous, with a hyaline border.

### *Nomia aureovittata*, Cockerell.

Natal: Weenen, 2840 ft., Jan. 1924 (*H. P. Thomasset*).

The abdominal bands are a rich cream-colour, not orange as in the type. Very near to *N. candida*, Sm., or *N. braunsiana*, Friese, but the area of metathorax differs. The type of *N. candida* is from Sierra Leone; of *N. braunsiana* from Kilimandjaro, at 1000–1900 m., though Friese says it also occurs at Willowmore, Salisbury, and in the Gaboon country. From the material in my possession I judge it to have been composite.

### *Nomia antecedens*, sp. n.

♀.—Length about 11 mm., anterior wing 8·7.

Black, robust, the head and thorax with short stiff brownish-grey hair, very short on mesothorax, but not at all hiding the surface; the colour of the hair above and below is about the same; mandibles reddened in middle; clypeus very densely punctured and dull, depressed and hairy in apical middle; antennæ broken in type*; vertex strongly punctured, but glistening between the punctures; mesothorax and scutellum very densely punctured, the intervals glistening; metathorax dull, the posterior face with long hair, the base with an exceedingly narrow transverse sulcus crossed by fine ridges; tegulæ moderate, punctured, dark brown with the outer anterior region broadly dull white. Wings yellowish hyaline, the outer margin not darkened; nervures and the unusually small stigma clear ferruginous; basal nervure very straight, meeting nervulus; second cubital cell extremely broad, receiving recurrent nervure near end; third cubital cell extending almost as far beyond second recurrent nervure as length of second intercubitus; marginal cell very obtuse at end. Legs black, with hair like that of thorax, ferruginous on inner side of tarsi, hind tibial scopa outwardly glistening white; hind basitarsi very broad, about as broad as tibia. Abdomen finely punctured, somewhat glistening; tergites 1 to 4 with broad (narrowed on first, very broad on the others) bare dull pale orange bands, whitened at sides; apex with grey-brown (chocolate-coloured) hair.

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* This has doubtless resulted from the deplorable habit of pinning the insect almost at the top of the pin, so that it is extremely difficult to handle it without damage. There should always be enough of the pin above the insect to take hold of. Otherwise it is next to impossible to examine the under side.

Sudan: Sobat, July 7, 1913 (*H. H. & D. King*).

This suggests a sort of gigantic edition of *N. candida*, Sm., or *braunsiana*, Friese, but the first tergite has a band, and the venation differs conspicuously. On the other hand, it might be compared with the larger *N. speciosa*, Friese, which has a more arched basal nervure, narrower second cubital cell, and other differences. There is also some resemblance to *N. delagoana*, Ckll., and *N. magniventris*, Friese.

The following corrections of nomenclature are by Dr. H. Friese, and are to be credited to him:—

### *Nomia inæqualis*, Friese, nom. nov.

*Nomia inermis*, Friese, 1930 (not Morawitz); Rhodesia.—H. Friese.

### *Nomia pulcherrima*, Friese, nom. nov.

*Nomia pulchra*, Friese, 1930 (not Friese, 1909); S. Africa.—H. Friese.

### *Nomia magnicornis*, Friese, nom. nov.

*Nomia longicornis*, Friese, 1930 (not Smith); E. Africa.—H. Friese.

### *Nomia anomala* (W. F. Kirby).

Zanzibar: Nazi Moja, Oct.–Dec. 1924 (*H. J. Snell*).

This male agrees with one from N. Rhodesia (*Silverlock*), received from the British Museum. The black brush at end of middle tarsus is thick and approximately circular, whereas Kohl's figures of the typical *N. anomala* from Socotra shows it shorter, narrowly extending on each side. I thought the Continental form might well be separable, in which case the name *N. pandeana*, Strand, would be available; but Mr. R. B. Benson has kindly made comparisons, and sees no reason to separate the two. *N. anomala* goes as far south as Durban.

### *Nomia interstitinervis*, Strand.

Zanzibar: Pemba I., Sept. 15–23, 1924 (*H. J. Snell*); Uganda, Madi, May 1927 (*G. D. H. Carpenter*); both females.

I cannot separate this from Strand's species, using his description, though his insect came from Guinea. It differs from the same sex of *N. cinerea*, Friese, by having the first tergite conspicuously punctured before the transverse ridge. As Strand remarks, it is like *N. anthidioides*, Gerst.

but with large punctures on mesothorax. Strand calls attention to the strong bend in the basal nervure, but says it is not knee-like; I should think that term would well describe it.

### *Nomia aculeata*, sp. n.

♂.—Length about 8·5 mm., anterior wing 6·7.

Black, with parallel-sided abdomen; mandibles and antennæ black, flagellum long and slender; tongue short, dagger-like; eyes very dark brown, very strongly converging below; face and lower part of front covered with pale ochreous hair; cheeks with dull whitish hair; surface of head above dull, a little shining laterad of ocelli; mesothorax almost entirely bare, dull and strongly punctured, the punctures running more or less in lines; scutellum with very thin reddish hair and similarly sculptured, but with a pair of very long slender needle-like black spines; postscutellum densely covered with greyish-white tomentum; metathorax dullish, with a very narrow basal transverse channel, crossed by weak irregular plicæ; tubercles fringed with dense pale grey hair; mesopleura strongly punctured; tegulæ enlarged, of the subquadrate type, black, with the hind margin broadly white. Wings greyish hyaline, the apical border only slightly darker; stigma and nervures almost black; basal nervure arched, falling a little short of nervulus; second cubital cell narrow, much higher than broad, receiving recurrent nervure at about the beginning of its last third. Legs shining black, with pale hair; anterior tarsi cream colour, somewhat broadened, with long pale hair laterally; middle and hind tarsi black; hind femora swollen, but not excessively so, with a fringe of long white hair beneath, and no tooth; hind tibiæ highly polished, trigonal, with a very large and long light yellow apical lobe. Abdomen very coarsely punctured on the basal position, the punctures apically becoming sparser and much weaker; the broad apical depressions black, with thin appressed pale hair, not forming evident bands; apex fringed with pale fulvous hair, and having on each side a sharp but short mandible-like lobe, with the point directed inward, the whole arrangement sugg sting the mouth of some beetle with the mandibles wide open; fifth sternite with a pair of very strong parallel ridges ending in round tubercles.

Sierra Leone: Nsala, June 4, 1929 (*E. Hargreaves*).

In Strand's table it runs to *N. garua*, Strand, but it is distinct from that and from *N. atrinervis*, Vachal. There is a strong general resemblance to *N. megacantha*, Ckll., from Natal, but that has much stouter scutellar spines and much more modified front tarsi. They are, however, evidently allied.

### *Nomia ambusta*, sp. n.

♂.—Length about 8·5 mm., anterior wing about 7.

Head and thorax black, legs and abdomen partly ferruginous; white hair on sides of face, on cheeks, and underside of thorax, but thoracic dorsum with short ochreous hair, abundant on scutellum and postscutellum, on mesothorax not dense enough to hide the surface; tongue short; mandibles rufous apically; orbits very strongly converging below; clypeus bigibbous, dullish, with very minute punctures; supraclypeal area dull, but a shining line between it and clypeus; front entirely dull; a little shining space laterad of each lateral ocellus; scape black; flagellum very long, dark brown above, ferruginous beneath; mesothorax and the simple scutellum entirely dull, with excessively dense minute punctures; metathorax dull, without any basal area, but a shining line between it and postscutellum; mesopleura dull, excessively densely punctured; tegulæ clear ferruginous, oval, hardly enlarged. Wings strongly reddened; stigma large, dark rufous, nervures fuscous; basal nervure falling short of nervulus; second cubital cell about square, receiving recurrent nervure beyond middle. Anterior and middle legs mainly black, but knees, ends of tibiæ, anterior tibiæ in front, and the tarsi more or less rufous; hind femora swollen, elevated, the base black, the apical part ferruginous, the black extending beyond the middle above; beneath, the femora have three teeth, two long and sharp, the third small; hind tibiæ rufous at base, behind and apically, with a long pallid pointed apical lobe, not so long as the tibia; hind tarsi dark with the joints at end and basitarsi at base rufous. Abdomen dullish, rufous, with broad black bands occupying the apices and following bases of the tergites; on tergites 3 to 5 the red is confined to the depressions; on the second the red occupies all but the extreme base, from which black lobes extend at sides, and the hyaline apical margin; the first is brownish red on disc, black at sides and base; there are thin bands of glittering appressed hair, not conspicuous; apical margin of sixth tergite rufous, shining.

Kenya Colony: Kisumu, Jan. 1919 (*T. J. Anderson*).

This is a very red member of the group of *N. tridentata*, Smith, easily distinguished by its colours. *N. frieseana*, Ckll., has a fulvous and brown banded abdomen, but the hind femora are unmodified.

### *Nomia entebbiana*, sp. n.

♂.—Length about 7·4 mm., anterior wing 7·2.

Black, the head and thorax with abundant stiff grey hair, with dark hairs intermixed on scutellum; tongue short; mandibles rufescent at tip; clypeus densely punctured, distinctly bigibbous; flagellum short, almost like a female, obscurely rufescent beneath, the colour bright at apex; mesothorax and scutellum closely punctured, very faintly shining; postscutellum densely covered with pale grey tomentum; metathorax dullish, minutely rugose, with no distinct basal enclosure or channel; tegulæ oval, little enlarged, the elevated boss black, the anterior margin broadly whitish hyaline. Wings hyaline, the outer margin not darkened; stigma very dark reddish, nervures dark brown; basal nervure meeting nervulus; second cubital cell small, higher than broad, receiving recurrent nervure at beginning of last third. Legs black, with pale hair, but hind femora greatly swollen, bright ferruginous with a large black dorsal patch, and having beneath, posteriorly, three oblique teeth, the first two long, the third small; hind tibiæ strongly curved, red at base, broad and black beyond, with an apical broad cream-coloured apical lamina, hardly half the length of the tibia; hind basitarsi red at base. Abdomen dull black, the apical depressions of tergites pellucid and shining, very narrowly on first, broadly beyond, with a little margin of red before the pellucid area; first tergite with stiff erect white hair; tergites 3 to 5 with narrow, even, pure white basal hair-bands, often concealed by the tergite before; apical part of venter pallid.

Uganda: Entebbe, June 1, 1914 (*C. C. Gowdey*); four males.

Closely allied to *N. tridentata*, Smith.

### *Nomia admixta*, sp. n.

♂.—So similar to the last that I at first regarded it as identical, but it is certainly distinct by the more hairy abdomen, with thin but evident hair-bands on the apical depressions of second and following tergites; the hair at sides of apical part of abdomen is long and abundant. The tegulæ have the elevated portion light brown, and the stigma is paler, reddish. Antennæ much shorter than in *N. tridentata*, Sm.

Natal: Weenen, 2800 ft., Jan.–Feb. 1924 (*H. P. Thomasset*); two males.

This has the aspect of a dry-country representative of the last, perhaps to be regarded as a subspecies.

The group of *N. tridentata*, Smith, with three spines or teeth on the swollen hind femora of the male, is widely distributed over tropical Africa, and even has a species (*N. triodonta*, Kohl) in Southern Arabia. A series of males may be separated thus :—

| | |
|---|---|
| Abdomen largely red; flagellum very long. | *ambusta*, Ckll. |
| Abdomen not at all red................ | 1. |
| 1. Flagellum long, bright red beneath; abdomen very hairy (Katona, E. Africa, March 1909, *Shirati*) .............. | [Friese [=*flavitarsis*, Fr.]. “*tridentata*, Sm.,” det. |
| Flagellum dark, or conspicuously red only at apex .......................... | 2. |
| 2. Hair of thorax above fulvous; wings distinctly darkened apically.......... | 3. |
| Hair of thorax above pale grey; wings not darkened apically .................. | 5. |
| 3. Wings strongly reddened (reddish-orange); white hair-bands on depressions of second and following tergites (Mfongosi, Zululand, *W. E. Jones*).... | [Friese [=*capensis*, Fr.]. “*tridentata*, Sm.,” det. |
| Wings not reddened .................. | 4. |
| 4. Second and following tergites with fulvous hair-bands on depressions; hind femora thickly hairy (Kibonoto, Kilimandjaro, 1300–1900 m., 1905, *Sjöstedt*)........ | [*N. tridentata*, var.). *orientalis* (Friese, as |
| Abdomen without evident hair-bands; hind femora not very hairy.......... | [*N. tridentata*, var.). *natalensis* (Ckll., as |
| 5. *N. entebbiana* and *N. admixta* (as separated above). | |

I have two females of this group, as follows :—

| | |
|---|---|
| Third tergite covered with appressed copper-red hair (Old Calabar, W. Africa, *V. Stefenelli*) ............................ | [det. Friese. *tridentata*, Sm., |
| Third tergite with greyish-white hair, forming a light band apically (Inyanga, S. Rhodesia, 4000 ft. alt., Dec. 1920) .. | [*N. tridentata*, var.). *capensis* (Friese, as |

There is some question as to the genuine *N. tridentata*, Sm. Meade-Waldo stated that the type was from W. Africa, but Smith wrote: “Cape of Good Hope: Gambia,” and I infer that the Cape specimen was the type, as Westwood's account of the supposed synonymous *N. crudelis*, from Gambia, indicates a larger insect, with a conspicuous band on the hind margin of first tergite. Thus it may well be that *N. crudelis*, Westw., should be accepted as a valid species. Both, however, had the thorax above with fulvous hair, and the abdomen with fulvous hair; “abdomine nigro, luteo-setoso, marginibus segmentorum luridis aut luteo-griseis, setis magis fulvis” (*crudelis*); “abdomen ovate and pubescent, that at the base cinereous, the rest fulvous; the apical margins of the segments, except the basal one, testaceous” (*tridentata*). The above female "*tridentata*" from Old Calabar must surely be Westwood's *N. crudelis*; the broad apical depression of the first tergite is obscurely reddish, and the apical margin of the raised part is red in middle. On Meade-Waldo's interpretation, this is also *N. tridentata*, Sm. I do not think any of the males cited above belong to it. If we suppose Smith's type of *tridentata* to have come from the Cape, it cannot be identified with any of the males just tabulated. It comes nearest to *N. orientalis*, but that has the hind femora entirely black except at apex, and the wings strongly darkened at apex; while the third antennal joint is clear red beneath, but the flagellum otherwise entirely dark. The hair of the scutellum and hind part of mesothorax is very rich bright ferruginous. Friese describes another supposed variety (*N. tridentata*, var. *digitata*) from Delagoa Bay and Algoa Bay. It (male) is smaller, with the abdomen hardly banded, and the apical process of tibia only about a quarter as long as tibia. The last character separates it at once from *N. natalensis*, which has the process large and long.

*N. ruficoxis*, Vachal, based on a female of this alliance, from Libreville, Congo, but cited by Friese also from Old Calabar, differs greatly from the supposed *N. crudelis* from Old Calabar. The latter is much larger, with scape black; tegulæ black, broadly red in front; thorax above with dense bright fox-red hair; second cubital cell almost square, receiving recurrent nervure about middle; legs black, with tarsi red at apex; scopa of hind tibiæ black. Thus there is little resemblance, and I am sure Friese is wrong in treating Vachal's species as a variety of *N. tridentata*.

I have the female of *N. natalensis* from Malvern, Natal, and it is close to *N. capensis*, but the wings are not dark apically; the hair of mesothorax, instead of being rich orange-fulvous, is pale, with brown hairs intermixed; the hind basitarsi are comparatively shorter and broader, and black; the stigma is dusky red with a black lower margin. Male *N. capensis* differs from male *natalensis* by the much shorter process of tibia. I refer to *capensis* the male from Zululand, cited in the table above. The wings are yellower than in the female, but there is not enough difference to justify separation on the scanty material seen.

*N. tridentata*, Sm., recorded by Strand from Aden, was I suppose *N. triodonta*, Kohl. The supposed male *N. tridentata* from Katona, in the above table, is really *N. flavitarsis*, Friese, of which *N. katonana*, Strand, is perhaps only a variation. The specimen agrees with *N. katonana* in having less than half of hind tibiæ black, but certainly has the structure of *N. flavitarsis*. The femur is not as in *N. tridentata*, and the hind tibia has a tooth on basal part. I had identified as *N. tridentata* a male from British E. Africa, Kabete, 6000 ft., Apl. 12, 1918 (*T. J. Anderson*). As now revised, this is typical *N. orientalis* (Friese).

### *Nomia magrettii*, Gribodo.

British E. Africa: Masai Reserve, April 14, 1913 (*T. J. Anderson*); female.

This agrees well with Gribodo's description. The tibiæ and tarsi are clear ferruginous; the three transverse bands of tomentum on thorax above are warm ochreous; the broad band of tomentum crossing first tergite is obtusely angular in middle, the apical point coming near to the end of the raised portion; second tergite mainly covered with pale ochreous tomentum, the bare black band narrow; stigma clear ferruginous, nervures fuscous.

### *Nomia duplocincta*, "Sichel," Vachal.

Sudan: Gendettu, Feb. 5, 1925, "from side bushes," Jan. 7, 1924, "in cultivations," Jan. 20, 1925, "from weeds" (*W. E. Giffard*); Port Sudan, Oct. 6, 1914, "taken in desert" (*H. H. King*): all males. One female, Gendettu, March 21, 1924," from cotton fields" (*W. E. Giffard*).

This insect has caused me much perplexity. The male has the broad black brush on middle tarsi, as in *N. anomala* (W. F. Kirby), but is easily separated by the much more swollen hind femora. The structure of the venter, with two little teeth on margin of fourth sternite, seems to agree with Vachal's account. *N. duplocincta* was from Senegal, but might belong to Engler's Sudanese province, which extends right across Africa south of the Sahara. But Vachal's female seems to be different, with the mesonotum covered with ochraceous tomentum. I herewith propose to consider the male the type of *N. duplocincta*. Vachal suggests that the female is *N. tegulata*, Sm., and the male *N. innesi*, Gribodo (described from Cairo). But *N. innesi* appears to be too small, and the special tarsal and abdominal characters are not indicated. *N. patellata*, Magr., based on the male from Eritrea, very nearly agrees, and may be the same, but the description says the last joint of middle tarsi is black, patelliform, not that it carries a brush of black hair. Taken literally, this would mean a condition like that of *N. savignyi*, Kohl, only more extreme. In Strand's table another difference is indicated; the postscutellum is said to be sparsely greyish-haired, instead of densely tomentose as in *N. tegulata*, &c. But the original description of *N. patellata* contradicts this statement, and a sketch of the type of *N. tegulata* sent by Mr. R. B. Benson seems to indicate the postscutellum as not densely tomentose, this and the lack of cross-ridges on the basal channel of metathorax separating it from the otherwise almost identical *N. anomala* from Durban (Meade-Waldo says of the type of *tegulata*: "Median segment basally impunctate, dull; wings subhyaline, more fuscous toward apex"). The wings of my *N. duplocincta* are not clouded apically; a little character, agreeing with *N. patellifera*, is the red extreme base of scape. The scutellum is unarmed. The female I had at first confused with *N. magrettii*, which it greatly resembles, but the legs are mainly black, the tarsi red apically, and the anterior tibiæ dark rufous in front, the band of tomentum on first tergite is not so broad, and does not come so near the margin of the raised part; the bare black band on second tergite is much broader than the band of ochreous tomentum before it.

Another member of this alliance, very closely related to *N. duplocincta*, is the following:—

### *Nomia kingi*, sp. n.

♂.—Length about 7·7 mm.

Aspect of *N. duplocincta*, with broad black brush on middle tarsi, and scutellum quite unarmed; but venter quite simple, without teeth or tubercles, but a little median copper-red spot subapically; hind femora thick but not swollen; apical pale yellow lamella on hind tibia very large, broad, rounded; scutellum duller, finely and densely punctured. Other characters are: head broad, orbits very strongly converging below; face with pure white hair; scape broadly rufescent basally, and narrowly at apex; flagellum dark reddish, the base bright clear ferruginous; mesothorax dull, not at all polished, with conspicuous punctures; tegulæ very large, pallid, the basal spot dark rufous; only an extremely narrow band of hair along front margin of mesothorax; postscutellum densely covered with greyish-white tomentum; channel at base of metathorax evident, shining, crossed by weak ridges; wings hyaline, not darkened at apex; stigma large, light reddish fulvous; basal nervure meeting nervulus; second cubital cell large, a little higher than broad; first recurrent nervure meeting intercubitus; knees and tibiæ light red, a faint dusky shade on middle tibiæ; basitarsi light yellow, anterior ones more reddish; small joints of tarsi pale ferruginous; hair of abdomen greyish white, first tergite with an apical spot on each side; punctures of first tergite very fine and close, except on the swollen subapical part, where they are large and irregular; punctures of second tergite very large.

Sudan: Erkowit, June 10, 1917 (*H. H. King*).

## XXXIX.—*A remarkable Mirid Larva from Cuba, apparently belonging to a new Species of the Genus* Paracarnus, Dist. (*Hemiptera*, Miridæ). By W. E. China, M.A.

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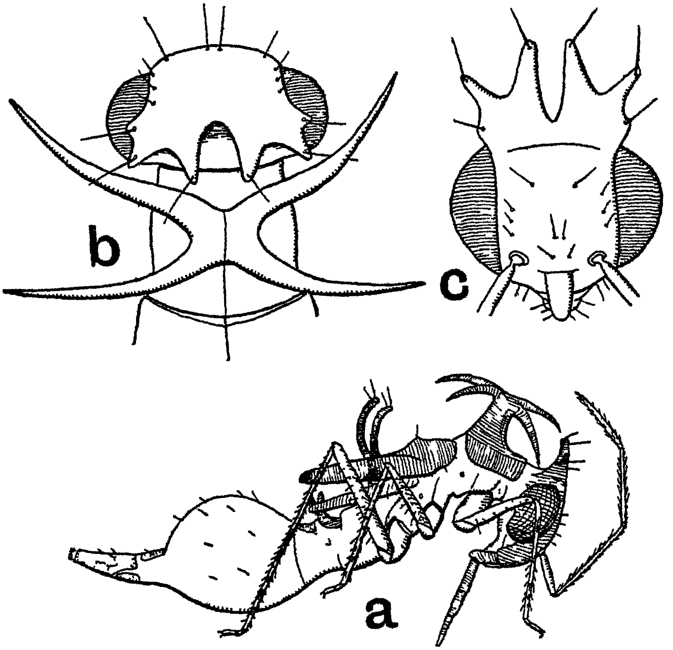
The material recently collected by Dr. J. G. Myers in the West Indies contains many interesting forms, and I am much indebted to him for the opportunity of studying it. Foremost among these forms in point of interest is a very curious Heteropterous larva, which is well worth description, even though there is no indisputable evidence to connect it with any adult specimens.

### *Description of Larva apparently in last Instar.*

The head is strongly deflexed and more or less vertical, with the apical region of the frons and clypeus curved backwards in a line with the axis of the body. The vertex is produced upwards and slightly backwards to form a pair of flattened horns, each with two main and one subsidiary spurs (fig. 1, *c*). At the apex of each spur arises an erect bristle. The clypeus is small and little prominent; the slender linear antennæ are inserted very far forward on the head in line with the base of clypeus; the first segment is about equal in length to two-thirds the length of an eye; the eyes are large and prominent. The rostrum is carried away from the sternum and the three ultimate segments are subequal, each slightly longer than the first, and distinctly pilose. The surface of the frons is finely shagreened, and that of the horn-like processes rugose. The pilosity of the frons is regularly and symmetrically arranged (fig. 1, *c*). Pronotum with an extraordinary erect anchor-like process arising as a wide column from posterior disc and spreading out apically into four long sharply pointed processes, circular in section (fig. 1, *a*); these processes are arranged in two pairs, one pair projecting on each side, the anterior process of each pair slightly longer and more sinuate than the posterior process (fig. 1, *b*). Surface of pronotum and column shining, that of the four processes finely shagreened. Mesonotum with a pair of small pointed tubercles placed near the inner basal angle of origin of each front wing-pad, each giving rise to a bristle. Mesonotal scutellar region with a pair of long, thick, apically rounded processes, divergent and anteriorly recurved from their middle, the apex of each process with two bristles. Basal abdominal segment dorsally with a pair of short, thick, apically rounded processes divergent and posteriorly directed, the apices of the processes each with a bristle. Wing-pads hyaline and extending to third abdominal segment. The abdomen is feebly "chitinized" and globularly swollen in middle, with a

Fig. 1.



A Mirid larva from a Cuban coffee plantation (possibly of *Paracarnus myersi*, sp. n.).

**a**, lateral view—note pronotal "anchor" and haired mesonotal and basal abdominal processes; **b**, head and pronotum from above, showing four spines of pronotal "anchor" and cephalic processes; **c**, frontal view of head to show cephalic processes.

"chitinized" plate on second tergite surrounding opening of scent-gland and some similar plates on the narrowed apical region, including an anal tubular sclerite (fig. 1, *a*). Legs slender. Colour sordid red with the processes darker, the wing-pads hyaline with claval region dark red, a median costal spot and the apex fuscous. Legs pale yellow, more or less striped with red.

Total length 2·75 mm.

*Habitat.* Cuba, Trinidad Mountains, 3 specimens, ix. 1929, "no. C. 189" (*J. G. Myers*).

On discovering these remarkable larvæ, a search was made for adults amongst Dr. Myers's Cuban material in the British Museum. Surely enough, two specimens of a Mirid species from the same locality, one of which bore the same number (C. 189), were found. These were sent to Dr. H. H. Knight, who kindly identified them as representing a new species of the genus *Paracarnus*, Dist. Now the genus *Paracarnus*, Dist., belongs to the division Macrolopharia (Dicypharia), the Palæarctic representatives of which are entirely predaceous*. The various species of *Brachyceræa*, Fieb. (*Dicyphus* auct.), all live on plants which possess glandular hairs and prey upon the small insects which become entangled in them. They are themselves immune owing to the structure of the tarsal claws. The larvæ of *Macrolophus* also live in a similar way. *Stethoconus cyrtopeltis* preys on the Tingid *Stephanitis pyri*, F., and *Campyloneura virgula*, H.-S., preys on the Psocid *Stenopsocus stigmaticus*, Imh. It is very probable that the same holds true of the American representatives of this division; indeed, the genus *Hyalioides* is known to be predaceous, and is also associated with Psocids.

Although species of the genera *Cyrtopeltis* and *Engytatus* (e. g., *C. tenuis*, Reut., and *E. volucer*, Kirk.) have been recorded as injurious to tobacco, it appears very probable that the damage was actually done by the tobacco thrips (*Thrips tabaci*, Lind.) upon which the Mirids were feeding.

It is most likely, therefore, that the new *Paracarnus* species is also predaceous. Unfortunately, Dr. Myers can remember nothing peculiar about the specimen labelled C. 189. His note referring to this number runs as follows:—

"At the dam quite extensive cultivations, including Mr. Rowe's cafetal (coffee plantation), where I obtained numerous Tipulidæ and some Hymenoptera and Hemiptera. Coffee too dense for much undergrowth."

---

* Schumacher, Zeits. Wiss. Insektenbiologie, xiii. p. 217 (1917).

It is, of course, possible that these larvæ have nothing whatever to do with the *Paracarnus*. But as they were in the last instar, and as the only Mirids taken at this time were *Paracarnus* species, an association of the two is not unreasonable. The extraordinary anchor-like process of the pronotum in the larva at once leads one to speculate on its probable function (if any), and, assuming the association with *Paracarnus* to be correct, we are at once supplied with a plausible theory. For if species of allied genera prey on Psocids, then perhaps this peculiar process is connected with life in a Psocid web. It could either be used to tear a way out of the webs which had become too dense, or might act as an anchor to prevent larvæ from falling out of the more open type of web and so away from the source of food. In any case the life-cycle would appear to offer an interesting subject for future study on the part of Cuban entomologists. The density of the coffee plantation mentioned by Myers would favour the growth of algæ and lichens upon which Psocids might feed.

I propose to dedicate the new species of *Paracarnus* to Dr. J. G. Myers of the Imperial Institute of Entomology, and describe it as follows *:—

### *Paracarnus myersi*, sp. n.

*Colour.*—♀. Head fulvous-yellow tinged with red at base of vertex and in buccal region; eyes dark brown to black; rostrum pale yellow with apex infuscate and base tinted with sordid red; antennæ pale yellow, the basal segment and basal half of third segment slightly fulvous, the extreme apex of second sordid red-brown, fourth segment missing in type-specimens. Pronotum reddish brown, a spot on each side of posterior margin of the collar and the posterior margin of the disc pale yellow; the calli also sordid yellow. Scutellum dark reddish brown with its apical third bright shining yellow. Hemielytra colourless—hyaline with the entire clavus, the extreme basal angle of corium (not of "embolium"), and a transverse band across apical region of corium which curves round to form a comma-shaped spot on the middle, all sordid red, the apical corial band somewhat brighter and not extending to apical margin of corium and of embolium; cuneus colourless; membrane infuscate except along base of cell and a hyaline spot at apex; cell-vein brown. Pleura shining sordid red, more or less infuscate on disc, especially of mesopleura. Lobe of metapleural scent-gland orifice ivory-white. Legs pale yellow, the posterior coxæ and apical three-fourths of hind femora reddish. Venter shining dark reddish brown with the middle region both ventrally and laterally pale green.

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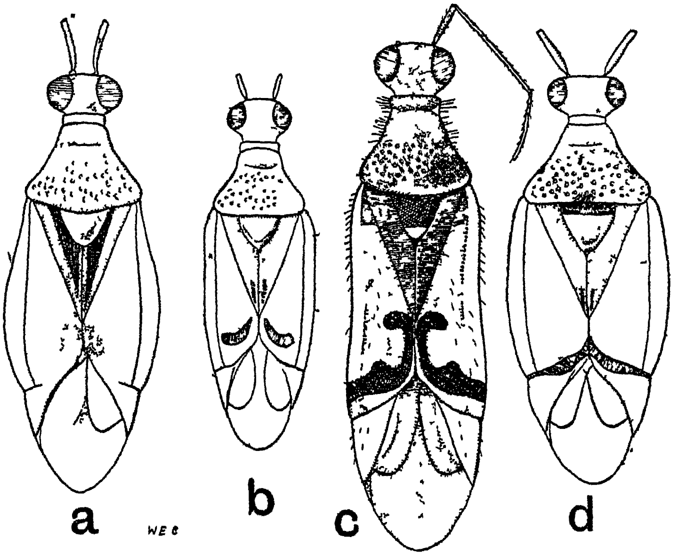
* I am much indebted to Dr. H. H. Knight for his help in the identification of this species, and for permission to intrude upon what is virtually his domain.

♂. Similar to female, but the pronotum paler sordid yellow with some infuscate spots on disc.

*Structure.*—♀. Head shining, strongly exserted, subglobular; eyes large; clypeus small, feebly prominent; vertex with a few pale erect hairs; antennæ inserted at margin of eyes in line with base of clypeus; relative length of segments 23 : 62 : 36 : —; rostrum held widely separated from sternum (typical of predaceous species), moderately short, scarcely reaching base of intermediate coxæ. Pronotum shining, comparatively broad at base, sides slightly concave, strongly anteriorly convergent, the anterior collar very prominent and rather long; calli prominent, disc strongly convex, regularly strongly punctate; the anterior

Fig. 2.



a, *Paracarnus elongatus*, Dist., ♀, Panama; b, *P. grenadensis*, Dist., ♂ Grenada; c, *P. myersi*, sp. n., ♀, Cuba; d, *P. mexicanus*, Dist., ♀ Mexico (a, b, and d are to show outline and colour-pattern only).

region of pronotum, particularly anterior collar and lateral margins, sparsely clothed with long pale erect hairs. Scutellum slightly elevated, but flat on disc, not convex, shining, impunctate with a few pale erect hairs. Hemielytra elongate, extending well beyond apex of abdomen, smooth, impunctate with a few pale erect hairs, particularly on the clavus; costal margins concavely sinuate; claval commissure about four-thirds the length of side of scutellum. Legs slender with pale hairs. Abdomen shining, moderately sparsely covered with short erect hairs.

♂. Similar in structure to ♀ (the head is missing in the single specimen).

Total length (♀) 4·2 mm.

*Habitat.* Cuba, Trinidad Mountains, ix. 1929 (*J. G. Myers*), 1 ♀, No. C. 185, 1 ♂, No. C. 189.

Most nearly resembles *Paracarnus grenadensis*, Dist., from which it differs in the more robust head, much larger and more prominent pronotal collar, much wider and more convex posterior lobe of pronotum, entirely dark brown clavus, dark brown scutellum with pale apex (instead of entirely pale), the apical transverse band on hemielytron larger and much better defined, and in the fuscous membrane.

The four species now known in this genus may be distinguished as follows :—

### *Key to Species of* Paracarnus, *Dist.*

1. Costal margin of hemielytron distinctly convex; scutellum swollen and with disc convex. 2.

Costal margin of hemielytron not convex, more or less broadly concave in middle; scutellum slightly elevated, but disc flattened ........ 3.

2. Pronotum only slightly broader across humeral angles than long in middle (28 : 25); eyes large, slightly wider (in dorsal view) than vertex between eyes (7 : 6) ............. *P. elongatus*, Dist., [♀, Panama.

Pronotum distinctly broader across humeral angles than long in middle (32 : 21); eyes small, much narrower (in dorsal view) than vertex between eyes (5 : 9)............... *P. mexicanus*, Dist., [♀, Mexico.

3. Eyes small, in dorsal view slightly more than half width of vertex between the eyes (4 : 7); hemielytra about twice as long as head and pronotum together; scutellum entirely pale.. *P. grenadensis*, Dist., [Is. Grenada, ♂.

Eyes large, in dorsal view distinctly more than half width of vertex between eyes (6 : 8); hemielytra about two and a half times as long as head and pronotum together; scutellum dark with only apex pale .......... *P. myersi*, sp. n., [Cuba, ♀.

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## XL.—*Some new Lamellibranchs from the Silurian of the Ludlow District.* By F. R. Cowper Reed, Sc.D., F.G.S.

[Plates VII.-IX.]

Amongst the large collection of fossils in the Ludlow Museum obtained from time to time from the Upper Silurian Beds of that district there are several new species which have not been previously described or figured, and through the kindness of Dr. Giles Lang and the Committee the present writer has had the opportunity of studying them. In the following pages a few of them are now described. One genus, *Maminka*, does not appear to have been previously recognized in the British Silurian.

### *Tancrediopsis ludensis*, sp. n.
(Pl. VII. fig. 3; Pl. IX. figs. 1, 1 *a*.)

Shell transversely suboblong, narrowing slightly posteriorly; anterior end rounded; inferior margin nearly straight; posterior end obliquely truncate at obtuse angle to cardinal edge; postero-inferior angle about 75°; dorsal margin very slightly angulated below umbo, with cardinal edges nearly straight; umbo low, broad, situated slightly behind middle at about two-fifths length of shell and directed somewhat backwards. Surface of valves gently convex in front of strong slightly curved angulation running from umbo to postero-inferior angle; above the angulation the surface is more or less steeply inclined and forms a slightly excavated subtriangular posterior area. Ornamentation consisting of regular equidistant rather thick prominent concentric lines. Dentition composed of anterior series of 20–21 small transverse teeth in front of umbo, decreasing in size towards each end, and of posterior series of 15–16 similar teeth, not extending to the posterior cardinal angle, and having the middle teeth larger than the others.

*Dimensions* (in mm.).—

| | No. 1. | No. 3. |
|---|---|---|
| Length .................... | 15·5 | 22·0 |
| Height at umbo.............. | 6·5 | 9·0 |

*Remarks.*—The three specimens in the Ludlow Museum (D. *d.* 65) on which this species is founded were obtained from the Lower Ludlow of Mary Knoll Dingle and Elton Lane; the one numbered 1 was collected by A. Marston, and those numbered 2 and 3 by R. Lightbody. In no. 3 the teeth are well displayed, while no. 2 has both valves opened out in juxtaposition, and no. 1 shows also the ornamentation. These specimens were labelled "*Nucula sulcata*, His.," and in the Jermyn Street Museum there is also a good specimen (no. 23147) from "W. of Vinnal Hill, Ludlow," formerly labelled "*Ctenodonta sulcata*, His.," but re-labelled by Wheelton Hind "*Palæoneilo* sp." Hisinger's species (1, p. 18, t. xvii. fig. 6, t. xix. figs. 3, 4) differs from this English form in being more inequilateral, the anterior end being broader and the posterior end less truncate, but it is undoubtedly closely allied. We may recognize a greater resemblance to *Tancrediopsis lauta*, McLearn (2, p. 101, pl. xii. fig. 11), and *T. altistriata*, McLearn (2, p. 100, pl. xii. figs. 4, 5), both from the Upper Silurian of Arisaig, Nova Scotia. The Australian species, *Palæoneilo victoriæ*, Chapman (3, p. 33, pl. iii. figs. 47–49), is also closely allied, as McLearn pointed out. The Devonian species termed *Nucula lamellata*, Hall (4, p. 320, pl. li. figs. 18–21, pl. xlv. fig. 13), is an allied American form. All may be referred to Beushausen's genus *Tancrediopsis* (5, p. 94).

### *Maminka (Matercula) anglica*, sp. n.
(Pl. VII. figs. 2, 2 *a*.)

Shell transversely subtriangular; anterior end broadly rounded; inferior margin long, gently arched; dorsal margin oblique, nearly straight, and meeting inferior margin behind at 60°–75°; umbo broad, situated at about one-half length of valve, directed forwards, rising well above hinge-line. Surface of valve very gently convex, somewhat flattened in middle, with a shallow rounded well-marked sinus crossing the valve nearly vertically or curving slightly forwards from the umbo to the inferior margin, which it meets with decreased depth rather in front of its middle. Ornamentation composed of numerous (50–60) regular subquadrate low flattened radial ribs, which are straight, equidistant, and of equal size behind the sinus, and separated by rather narrower flat interspaces, but in front of it they are smaller and more closely placed, becoming suddenly again wider and further apart on the anterior slope of the body and on the flattened anterior cardinal angle.

*Dimensions* (in mm.).—

| | I. | II. (D. *d.* 78). | III. (D. *d.* 79). |
|---|---|---|---|
| Length ........ | 20·0 | 21·0 | 25·0 |
| Height.......... | 14·0 | 16·0 | 17·0 |

*Remarks.*—One left valve (No. I.) of this species was collected by the author from the Lower Ludlow of Millichope, and there is a good example of a right valve (D. *d.* 78 in La Touche's Catalogue) in the Ludlow Museum from the Lower Ludlow of Mocktree, collected by H. Pardoe, which is here figured (No. II.), and another from an unknown locality (D. *d.* 79). We must ascribe these shells to Barrande's Bohemian genus *Maminka* (*Matercula*) on account of the median sinus, to which he attached special importance, and our new species may be compared with *M. comata*, Barr. (6, p. 105, pl. 183. vii. 1–6, pl. 186. i.), and *M. tenax*, Barr. (6, pl. 183. vi. 3–9, pl. 187). The genus does not appear to have been previously recognized in the British Ludlow Rocks.

### *Dualina impersonata*, sp. n. (Pl. VII. figs. 1, 1 *a*, 1 *b*.)

Shell transversely suboval; posterior end broadly rounded, passing into inferior margin, which is slightly arched; anterior end projecting and sharply rounded below, but oblique and gently arched above; umbo subcentral, pointed, directed forwards but not enrolled or twisted, rising slightly above hinge-line; cardinal edge short, arched, passing imperceptibly into anterior and posterior margins. Surface of valve gently convex, somewhat flattened in posterior third behind a low broad indistinct umbonal ridge arching back from the umbo to the rounded postero-inferior angle; a very weak ridge curving forwards in a concave manner from umbo to antero-inferior angle obscurely defines long sublanceolate inclined area but without forming a true lunule. Surface of valve covered laterally with 28–30 low flattened subquadrate narrow radial ribs of equal size, the anterior ones curving gently forwards, all separated by flat interspaces equal or subequal in width to these ribs; posterior third of valve and anterior slope with 7–8 smaller closer placed ribs and 5–7 larger lower rounded ribs towards cardinal margins. Fine concentric striæ over all, crossing the anterior-lateral and median ribs somewhat obliquely.

*Dimensions* (in mm.).—

| | (D. *d.* 81.) |
|---|---|
| Height .................... | 26·5 |
| Length .................... | 32·0 |

*Remarks.*—There is one good right valve (D. *d.* 81) of this species in the Ludlow Museum from the Lower Ludlow of Evenhay Lane, presented by A. Marston, and labelled "*Pleurorhynchus* sp.," but it must be referred to the genus *Dualina*, most resembling *D. excisa*, Barr. (6, pls. 24–27, 36, 98), though it is also related to *D. robusta*, Barr., *D. secunda*, Barr. (6, pl. 24. figs. 1–39 etc.), and *D. comitans*, Barr. (6, pls. 19, 22, 79). There is a close resemblance between the genera *Dualina* and *Paracardium*, and the difficulty of distinguishing them by isolated valves is specially noticed by Heller (7, p. 220, t. i. fig. 19). Frech, indeed, considered *Cardium latum*, Münst. (8, p. 217, t. 143, fig. 5), to be identical with *Dualina robusta*, Barr., whereas Barrande and Heller (*op. cit.*) refer it to the genus *Paracardium*.

### *Chænocardiola marstoni*, sp. n. (Pl. VIII. fig. 2.)

Shell high, subtriangular, with gently arched obliquely truncated long dorsal margin having a sharp narrow raised edge, meeting inferior margin at about 120° at about one-third the height of the shell; inferior margin strongly arched, curving up steeply in front with rounded anterior margin below, but becoming concave above. Umbo high, acutely pointed, anterior, incurved, directed forwards, somewhat overhanging anterior margin. Surface of valve moderately convex, most so towards anterior side, somewhat flattened towards dorsal edge. Ornamentation composed of 40–50 narrow low simple rounded radial riblets, closely placed and curving gently forwards, indistinctly arranged in groups and crossed by delicate concentric striæ and 2–3 weak low broad rounded rugæ on anterior slopes below umbo.

*Dimensions* (in mm.).—

| | |
|---|---|
| Height | 14·0 |
| Length | 12·5 |

*Remarks.*—Of this new species only the right valve and its external impression are known, and they were collected by the author from the Lower Ludlow beds of Millichope on Wenlock Edge. The correct generic reference of this shell seems to be *Chænocardiola*, Holzapfel (emend. Beushausen) (5, p. 364), rather than *Dualina*, for it more resembles *Ch. paradoxa*, Holz. (5, p. 368, t. xxvii. figs. 12–15), and *Ch. carinata*, Beush. (5, p. 367, t. xxviii. figs. 1, 2), of the Rhenish Devonian than *Dualina longiuscula*, Barr. (6, pl. 34. ii.; 8, pl. 35. ii. 1–29), and *D. fidelis*, Barr. (6, pl. 19. figs. 1–34), of the Bohemian Silurian. The unnamed lamellibranch from the Gotlandian of Scania which Moberg and Grönwall (18, p. 78, t. vi. fig. 8) figured and mentioned as resembling *Lunulicardium graptolithiphilum*, Röm., and *L. striolatum*, Röm., appears to be much like our shell.

### *Lunulicardium insulare*, Reed.

This species (9, p. 545, text-figs. 6, 7) was founded on a single specimen from the Lower Ludlow of the Woolhope district; but a good example of a right valve (D. *d.* 80) occurs in the Ludlow Museum from Maryknoll Dingle, measuring 11 mm. in height and 16·5 mm. in length. At first it seemed that *Cardium plicatum*, Münst. (8, p. 215, t. 142. figs. 9 *a–e*; 7, p. 215, t. 1. fig. 14; 10, p. 18, t. iv. figs. 326–334), from Elbersreuth was allied to it, but this species is now usually referred to *Dualina* and does not show the sharp angulation of the valves of our species, which, indeed, more resembles *Lunulicardium striolatum*, Römer (19, p. 123, t. x. figs. 13 *a*, *b*).

### *Lunulicardium relegatum*, sp. n. (Pl. VIII. fig. 5.)

Shell high, rounded subrhomboidal, slightly oblique, anterior margin nearly vertical in upper part and excavated by sharply depressed sublanceolate lunule; lower half of anterior margin slightly arched forwards, passing into sharply rounded semielliptical inferior margin curving up steeply behind into posterior margin which is long, slightly oblique, nearly straight, and meets cardinal margin at about 110°; cardinal margin straight, less than length of shell, with narrow flattened striated band-like ligamental area. Umbo acutely pointed, anterior, directed forwards, prominent but not rising above cardinal margin. Body of shell gently convex, most so anteriorly, with somewhat flattened subtriangular posterior subalate portion, not marked off from rest of body. Surface of valve ornamented with 24–26 low broad rounded closely placed straight radial ribs of equal size, with one narrower one intercalated at junction of body and subalate portion. Fine concentric striation over all.

*Dimensions* (in mm.).—

| | (D. *g*. 48.) |
|---|---|
| Height | 19·0 |
| Length (max.) | 16·5 |
| Length of cardinal margin | 9·5 |

*Remarks*.—This shell, of which there is one perfect impression of a left valve (D. *g*. 48) in the Ludlow Museum from the Upper Ludlow of Whitcliffe, must be referred to the genus *Lunulicardium*, but its appearance is strangely much like some species of *Byssonychia*. *L. tardum*, Barr. (6, pl. 234. iii. 1–8), *L. tenellum*, Barr. (6, pl. 237. i. 1–10), and *L. simplex*, Barr. (6, pl. 234. i. 1–28), seem to be allied to it to a varying extent, but Beushausen has referred to *Chænocardiola* some Devonian species which are inseparable from those from the Devonian of America placed by Hall in *Lunulicardium*. There is a specimen (no. 24132) in the Jermyn Street Museum (Wyatt Edgell Coll.) from the Upper Ludlow of Ludlow labelled by Wheelton Hind "cf. *Lunulicardium tardum*, Barr.," which is extremely like our Whitcliffe shell, but the ribs seem rather narrower and the valve is relatively broader and lower. Probably it belongs to a closely allied species or variety. The genus *Lunulicardium* has been variously interpreted by different authors, and Beushausen's limitation of it does not seem entirely satisfactory.

### *Grammysia morata*, sp. n. (Pl. VII. figs. 4, 4 *a*, 4 *b*.)

Shell swollen, transversely subrhomboidal, narrowing behind and bluntly pointed; anterior end small, sharply rounded; inferior margin gently arched; dorsal margin straight, about two-thirds length of shell; posterior end produced, obliquely truncated at about 45° to inferior margin. Valves deep, strongly swollen, most so along prominent curved subangular umbonal ridge dying out posteriorly, with surface of valves somewhat flattened and steeply inclined above it being nearly at right angles anteriorly to lower half of valve, which is convex and almost equally divided by a shallow narrow curved transverse groove or constriction arching obliquely backwards from the umbo to meet the inferior margin at about two-fifths its length. Umbones subterminal, small, pointed, directed forwards, incurved, with small deep cordate lunule below them. Surface of valves ornamented anteriorly with oblique concentric sharply rounded thick rugæ, strongest in front of transverse groove, bifurcating or trifurcating behind it and becoming weaker or dying out on umbonal ridge, above which the surface has only very faint rugæ and fine concentric striæ.

*Dimensions* (in mm.).—

| | (D. *d.* 76.) |
|---|---|
| Length | 35 |
| Height | 19 |
| Thickness | 25 |

*Remarks.*—This shell, of which there is one complete uncrushed example with both valves well preserved (D. *d.* 76) in the Ludlow Museum from the Lower Ludlow beds, locality unknown, is much more inflated than *Gr. semisulcata* (Sow.) (11, p. 617, pl. 8. fig. 6), and has the umbonal ridge more prominent and the umbones more terminal and lower. It seems more to resemble *Gr.* [*Cypricardia*?] *undata* (Sow.) (11, p. 609, pl. 5. fig. 4), which Wheelton Hind (12, p. 540, pl. v. figs. 13–16) puts in the genus *Grammysia*, but which McLearn thinks is like his *Cuneamya crassiornata* (2, p. 96, pl. x. fig. 25). It may be preferably put in the genus *Grammysia*, for it much resembles *Gr. communis*, Hall (4, p. 378, pl. lxi. figs. 24–28, pl. xciii. fig. 20), and *Gr. subarcuata*, Hall (4, p. 375, pl. lxi. figs. 19–22, pl. xciii. fig. 26), of the Chemung Group.

### *Rhytimya* (?) *lineata*, sp. n. (Pl. VIII. figs. 3, 3 *a*, 4.)

Shell transversely subelliptical, about 2½ times as long as high, inferior and dorsal margins subparallel. Umbones low, broad, incurved, directed forwards, subanterior; anterior end of shell short, steeply descending, with deeply excavated subcordate lunule; posterior end sharply rounded, obliquely subtruncate above; dorsal margin slightly arched, nearly straight; valves convex, more or less swollen, having very weak broad rounded umbonal ridge dying out before reaching posterior inferior angle and obscurely marking off a somewhat flattened or excavated area above it. In front of the umbonal ridge the surface is ornamented with strong subangular slightly oblique concentric rugæ of equal thickness, increasing in number by rare division or intercalation behind the faint shallow transverse depression which crosses the valve obliquely from the beak to the anterior third of the inferior margin; the concentric rugæ become much weaker on the umbonal ridge and are obsolete on the surface above it. Posterior two-thirds of the shell covered with fine close radial thread-like lines (bearing a series of granules) which are completely absent on corrugated portion in front of the oblique transverse depression.

*Dimensions* (in mm.).—

| | (No. 2, D.*g*. 43.) | (No. 5, D.*g*. 43.) |
|---|---|---|
| Length .................. | 20·0 | 41 |
| Height .................. | 8·0 | 14 |

*Remarks.*—The best specimen (no. 2, D.*g*. 43) of this species, showing the ornamentation well preserved on both valves, and here figured as the type, is from the Upper Ludlow of Whitcliffe, Ludlow, and was presented to the Ludlow Museum by R. Lightbody. Another larger specimen (no. 5, D. *g*. 43), from the Upper Ludlow of Maryknoll, is somewhat crushed, but has the deep lunule well exposed. In internal casts the radial lineation is often nearly or quite invisible. These shells were originally labelled "*Orthonota amygdalina*, Sow.," but subsequently "*O. semisulcata*, Sow." But it would seem that they should be placed in the genus *Grammysia* if we go as far as to accept Beushausen's (5, pp. 226–229) comprehensive conception of the genus, though in many respects they show much resemblance to *Pholadella*, Hall (4, p. xliii.), which is closely allied. The radially striated *Gr.*? [*Orthonota*] *speciosa* (Billings) as figured by McLearn (2, p. 95, pl. xix. fig. 17), from the Upper Silurian of Arisaig, N.S., is much like our species, and we may conclude that this shell as well as ours should preferably be put in the genus *Rhytimya*, Ulrich (13, p. 618), which belongs to the Pholadellidæ, though this genus does not appear to be known out of the Ordovician.

### *Endodesma* (?) *protractum*, sp. n. (Pl. VIII. fig. 6.)

Shell transversely suboblong, more than twice as long as high, upper and lower margins nearly straight and subparallel; anterior end subtruncate, steeply descending, sharply rounded, and projecting below; inferior margin nearly straight, with small weak sinuation at about one-fourth its length; posterior end sharply rounded, subtruncate above; hinge-line long, more than three-fourths length of shell. Umbones subanterior, broad, low, directed forwards, slightly incurved, scarcely rising above hinge-line. Surface of valves gently convex, most so in middle, somewhat compressed posteriorly, with low weak rounded broad umbonal ridge near umbo, completely dying out at half length of valve, having the surface above it scarcely flattened and bearing a long narrow lanceolate faintly defined escutcheon. Anteriorly a nearly obsolete, very weak, shallow depression (not a groove) arising near the umbo crosses the valve to the small sinuation in the inferior margin. Anterior part of valve ornamented with strong narrow concentric oblique rugæ, somewhat irregular, splitting up into two or more weaker ones behind depression and dying out before middle of valve; fine concentric striæ between them continued over whole of valve and distinct on posterior part.

*Dimensions* (in mm.).—

| | (D.*d.* 77.) |
|---|---|
| Length | 58 |
| Height | 26 |

*Remarks.*—One good specimen (D.*d.* 77) of a complete shell with the valves opened out in juxtaposition occurs in the Ludlow Museum labelled "*Orthonota semisulcata* (Sow.)" from the Lower Ludlow beds, but the locality is unknown. The more elongated shape of this shell and the absence of any strong transverse furrow distinguish it from typical examples of *Grammysia semisulcata*, and it is more like some of the shells from Girvan which Wheelton Hind (12, p. 540, pl. v. fig. 16) referred to *Grammysia undata* (Sow). "*Mya*" *rotundata*, Sow. (11, p. 613, pl. 6. fig. 1), of the Aymestry Limestone, bears a certain resemblance, but in that species the concentric rugæ are not so oblique; our species also seems more elongated, but it may only be a variety. We may also remark on the similar appearance of some examples of *Grammysia communis*, Hall (4, p. 378, pl. lxi. figs. 24–28), of the Chemung Group of New York, as figured by Hall, though it is not identical with our allied *Gr. morata* above described. But there is a noticeable resemblance to the so-called *Modiolopsis kelsoensis*, Williams (20, p. 123, pl. viii. figs. 3, 5), of the Grimsby Sandstone of the Medina-Cataract formation of the Ontario Peninsula. The generic position of our Ludlow shell is most probably in *Endodesma*, Ulrich (13, p. 525), which, as Ulrich remarks, seems to be nearer to the genus *Rhytimya* than to the genus *Modiolopsis*, sens. str., and it can hardly be placed in the genus *Grammysia*, sens. str.

*Euthydesma? (Salweyia) subobliquatum*, subgen. et sp. n. (Pl. IX. figs. 5, 5 *a-c*, 6.)

Shell flattened, compressed, equivalve, transversely subelliptical to suboval, slightly oblique; umbones pointed, large, prominent, subanterior, rising well above hinge-line, directed forwards and slightly incurved; postumbonal hinge-line long, straight, horizontal, about three-fourths the length of the shell; anterior end of shell obliquely subtruncate above, somewhat concave, rounded below, passing back into long gently arched inferior margin; posterior end broadly rounded below, subtruncate above; posterior cardinal angle obtuse, about 120°; hinge-line behind beak with long narrow, nearly vertical, slightly excavated external ligamental area decreasing in width posteriorly and marked by two to three fine longitudinal grooves; no hinge-line in front of umbones. Surface of valves somewhat flattened, gently convex in anterior median part and in umbonal region, with a very weak umbonal rounded ridge running back a short distance at a small angle with the hinge-line, but rapidly dying out, the valve being somewhat flattened or slightly concave above it. Ornamentation composed of numerous narrow low subquadrate or flattened straight radiating ribs of equal size (about ten in 10 mm.) at less than or nearly their own width apart, except near margins and on posterior upper slopes, where they lie much more closely, the interspaces being reduced to fine impressed lines; rarely a short fine secondary radial rib is developed in some of the broader interspaces near the margin; delicate concentric striæ cross the whole surface, and a few coarse concentric growth-wrinkles occur near the margins.

*Dimensions* (in mm.).—

| | No. 1. | No. 2. | No. 3. | No. 4. |
|---|---|---|---|---|
| Length .......... | 81 | 42 | c. 70 | 70 |
| Height .......... | 63 | 33 | 55 | 53 |

*Remarks.*—There are four specimens from the Lower Ludlow of Mocktree in the Ludlow Museum (D. *d.* 73), presented by Mr. H. Salwey and G. Pardoe, varying in length from 42 mm. to 81 mm. The smallest one (no. 2) has both valves complete, but is somewhat crushed and distorted; the largest (no. 1) is a right valve, and no. 3 is a left valve partly broken behind. No. 4 is a well-preserved right valve, and in all except no. 2 the ligamental area and hinge-line are well seen. These specimens were labelled "*Cardiola striata*? (Sow.)," but they are more flattened, more transverse, and have a less swollen umbo than in Sowerby's type-specimen (no. 49640) from the Aymestry Limestone in the Jermyn Street Museum. Sowerby's figure (11, p. 614, pl. 6. fig. 2) and description of *Cardium striatum* are misleading, as a close examination of the specimen proves, and it is wrongly orientated on the plate, for the right-hand edge of the figure is really the chipped dorsal edge and should be placed horizontal, the left-hand side of the figure being the anterior end of the valve which descends steeply below the umbo, the latter being subanterior in position and not central. The convex anterior slope descends more steeply to the margin (which is slightly excavated) than the dorsal side, and along this dorsal margin the shell is somewhat flattened and compressed; the posterior end of the shell (right-hand side in Sowerby's figure) is broken, but the concentric growth-ridges show that it was rounded and that the shell was suborbicular and altogether shorter and less transverse than our Mocktree specimens; the valve is also more inflated and the umbo broader and more swollen. But otherwise it shows a great resemblance to our species, and we may probably ascribe Sowerby's specimen to the same genus, though the ligamental area along the dorsal edge is not seen owing to this margin being broken and imperfect. The radial ribbing is also of the same type, but rather finer. Sowerby refers (*op. cit.*) to a larger oblique variety of *C. striatum* with more distant and deeper striæ (=riblets) which also occurs in the Aymestry beds, but he does not figure it. An examination of this mentioned specimen (no. 49641), which is a left valve and was collected from the "landslip in Wheeler Valletts Wood, north flank of Bringwood Chase, 2 miles E. of Downton," proves that it must be ascribed to the same genus, as it has the same general character, but it seems intermediate in most respects between the typical short *Cardium striatum* and our more transverse Mocktree species, for it is relatively shorter and more convex than the latter and has rather coarser ribbing. It shows the subanterior umbo and straight hinge-line, and the ligamental area, which is partly exposed. In the Jermyn Street Collection there is also a specimen of a left valve (no. 24088) with the umbo broken, but with the ligamental area partly preserved, which has the same shape and precisely the same characters as ours from Mocktree. This specimen, which comes from the Aymestry Limestone of Shucknall Hill, Woolhope, has the tablet inscribed "? *Cardiola* ? (*Amphicoelia*) ? *striata*, Sow.," and Wheelton Hind in his MS.

list wrote of this as follows: "not *Cardiola? striata* (Sow.), but same genus and species as 24101"; and of 24101 he wrote in the same list, "this is probably an undescribed genus, it is not *Cardiola striata* of Sow. or Barrande's genus *Slava*, but that sp. should be new reference." In no case did Wheelton Hind mention *Prælima* in connection with them. I am indebted to Dr. Stubblefield for this information. The generic reference of these shells has always been a matter of doubt, and there has been but little agreement about it. As remarked on a previous occasion (15, p. 163) *Cardium striatum* has often been put in the genus *Ambonychia*, but the British Museum examples of this species are labelled "*Prælima striata* (Sow.)." Barrande (6, p. 144) stated that the genus *Prælima* had no trace of an area, though *Pr. proæva*, Barr. (6, pl. 108. figs. 4–8), much resembles our Mocktree shells in general appearance. We should suspect that *Cardiopsis*, Meek and Worthen (4, pp. xxxvii and 433), might contain not only Sowerby's *C. striatum* and its variety as well as our Mocktree form if the latter were inequivalve. But the crushed Mocktree specimen (no. 2, D. *d.* 73), having both valves in position, seems to show that our shell is equivalve. *Dexiobia*, Winchell, may be identical with *Cardiopsis* as Wheelton Hind suggested (12, p. 535). *Byssonychia*, Ulrich (13, p. 498), is ruled out by having cardinal and lateral teeth, of which our specimens show no trace, and it has a byssal opening in the upper half of the anterior side. *Clionychia*, Ulrich (13, p. 493), agrees with ours in having no byssal opening and no cardinal or lateral teeth, and in possessing an excavated linear ligamental area along the straight hinge-line; the surface, however, has no radial riblets or striæ. *Amphicœlia*, Hall (14, p. 339, pl. 14. figs. 13–15), has a large triangular cartilage pit below the beak, though in general external characters it bears a considerable resemblance. In *Palæocardia*, Hall (14, p. 341, pl. 14. figs. 11, 12), the hinge-line is very short and extends a little in front of the beaks, thereby differing considerably from our species. The commonly used genus *Cardiola*, Broderip, has no teeth in the type, but the ligamental area extends on both sides of the beak, which is an important difference from *C. striatum*. The nearest genus is *Euthydesma*, Hall (4, p. xxxii), of which the type is *E. subtextile* (Hall) (4, p. 385, pl. lxiii. figs. 11–16, pl. xciii. figs. 28, 29), from the Portage group of New York, for it has the same general shape, subanterior high beaks, long hinge-line, and ligamental area behind the beaks as in our species, and it seems possible that this genus is the one to which it should be referred. But the genus has not been recorded from any pre-Devonian beds, and we may hesitate to place the Mocktree shells in it, since only "slender radial striæ" are described as occurring on the surface of this American genus. Finally, since Wheelton Hind was of the opinion that the specimen no. 24088 from the Aymestry Limestone of Shucknall Hill, which is identical with our Mocktree shell, belonged to a new genus, we may with some confidence give it at any rate a new subgeneric designation, for which *Salweyia* is suggested, after the donor of the type-specimen now figured. The definition of *Salweyia* will be as follows:—

Shell equivalve, inequilateral, subovate, transverse; beaks subanterior, high, prominent, pointed, directed more or less forward, somewhat incurved. No lunule. Valves gently convex anteriorly, more or less compressed behind. Hinge-line behind beak, straight, horizontal, rather less than length of shell, with narrow excavated steeply inclined external ligamental area along it. No teeth. Surface of valves ornamented with numerous straight radial narrow equal low riblets.

Genotype: *Salweyia subobliquata*, sp. n., Lower Ludlow, Mocktree.

*Pterinea aymestriensis*, sp. n. (Pl. VIII. fig. 1.)

Shell obliquely subtriangular, transversely extended, alate, acutely pointed behind. Left valve with long straight hinge-line; large elongated acutely triangular flattened posterior wing, not sharply separated from body, projecting behind in a sharp point of about 35°, with long oblique posterior edge nearly straight, but excavated at junction with body. Body gently convex, most so anteriorly, flattening out towards lower posterior margin; anterior margin broadly arched, obliquely sloping back and passing into more strongly arched long inferior margin which curves up gradually behind to wing. Umbo somewhat swollen, low, blunt, subanterior, rising slightly above hinge-line. Anterior ear small, depressed (not well preserved). Surface of body ornamented with numerous fine straight radiating subequal linear ribs, mostly in closely placed pairs or in groups of three or four, separated by wider interspaces bearing one or two smaller linear ribs, with a few concentric growth-ridges on marginal part of body; posterior wing ornamented with finer much more closely placed equal linear radial ribs crossed by fine concentric striæ.

*Dimensions* (in mm.).—

| | |
|---|---|
| Length along hinge-line ………… | 49 |
| Height ………………………… | 31 |

*Remarks.*—There is only one well-preserved left valve (D. *e.* 43) in the Ludlow Museum from the Aymestry Limestone, but the locality is unknown. It was presented by A. Marston, and is in good preservation. On the old label it is marked as a new species, but on a later label it is referred to *Pterinea sowerbyi*, McCoy, with a query. It is more like *Pterinea adjuncta*, Reed (9, p. 539, pl. xlii. figs. 2 *a*, *b*), from the Lower Ludlow of the Woolhope area, but the ornamentation is somewhat different. *Pt. lineatula*, d'Orb., as figured by Sowerby (11, p. 610, pl. 5. p. 10) and by La Touche (16, pl. xiv. fig. 465), from the Upper Ludlow, is also allied, but ours has a longer and more pointed posterior wing. The feeble separation of the body from the posterior wing and the pointed extension of the latter recall the genus *Pteronitella*, but it must undoubtedly be referred to *Pterinea*.

### *Pterinea nupera*, sp. n. (Pl. IX. figs. 2, 3, 4.)

Shell small, obliquely subrhomboidal, with nearly vertical high posterior edge broadly excavated below posterior wing. Body convex, rounded, obliquely suboval, rising well above posterior wing but not sharply marked off from it; inferior margin long and gently arched; anterior margin high and steep; posterior end sharply rounded and slightly projecting behind; umbo subacute, slightly incurved, elevated somewhat above hinge-line and situated at about one-third its length. Surface of body ornamented with 30–40 closely placed rather unequal straight radiating rounded ribs, increasing in number by intercalation at about one-third or one-fourth their length. Posterior wing subtriangular, depressed, flattened, pointed behind at about 45° and with nearly straight oblique posterior edge; surface marked with strong concentric lines, crossed by faint radial striæ. Anterior ear small, subtriangular, rounded, slightly convex, not strongly marked off from body, with rectangular cardinal angle and crossed by strong concentric growth-lines or rugæ and occasionally by faint radial lines. Post-umbonal cardinal margin having one strong and one or two weak long thin straight lateral teeth, slightly diverging behind; one short straight lateral tooth parallel to hinge-line in front of umbo is also present.

*Dimensions* (in mm).—

| | (D.*f.* 19.) |
|---|---|
| Length (oblique) .................. | 14·5 |
| Height .......................... | 9·5 |

*Remarks.*—There is one tablet (D. *f.* 19) in the Ludlow Museum containing seven left valves of this shell, all of which are of about the same size; they come from the Upper Aymestry of Wigmore Road, and were presented by Mr. R. Lightbody. On these the above description is founded. Other specimens have been collected by the author at Norton from the Upper Ludlow. The species is new, but we may closely compare it with the shells termed *Actinopteria fornicata*, Williams (17, p. 343, pl. 30. figs. 14–16), and *A. bella*, Williams (17, p. 342, pl. 30. figs. 17, 19), from the Silurian of Maine, for general shape and characters, though these have a rather more acutely pointed posterior wing. *Pterinea emacerata* (Conrad), from the Silurian of New York and other localities in America, is also closely allied (21, p. 282, pl. lix. figs. 1 *a–e*).

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## EXPLANATION OF THE PLATES.

### PLATE VII.

*Fig.* 1. *Dualina impersonata*, sp. n. Right valve, × 1½. Lower Ludlow, Evenhay Lane, Ludlow (D. *d.* 81, Ludlow Museum).
*Fig.* 1 *a.* Ditto. Cardinal view of same specimen, × 1½.
*Fig.* 1 *b.* Ditto. Portion of surface of same specimen, × 5.
*Fig.* 2. *Maminka (Matercula) anglica*, sp. n. Right valve, × 2½. Lower Ludlow, Mocktree (D. *d* 78, Ludlow Museum).
*Fig.* 2 *a.* Ditto. Portion of surface of same specimen, × 5.
*Fig.* 3. *Tancrediopsis ludensis*, sp. n., × 3½. Lower Ludlow, Maryknoll Dingle, Ludlow (D. *d.* 65, Ludlow Museum).
*Fig.* 4. *Grammysia morata*, sp. n. Complete shell, × 1½. Lower Ludlow, locality unknown (D. *d.* 76, Ludlow Museum).
*Fig.* 4 *a.* Ditto. Dorsal view of same specimen, × 1½.
*Fig.* 4 *b.* Ditto. Anterior view of same specimen, × 1½.

### PLATE VIII.

*Fig.* 1. *Pterinea aymestriensis*, sp. n. Left valve, × 1½. Aymestry Limestone, locality unknown (D. *e.* 43, Ludlow Museum).
*Fig.* 2. *Chænocardiola marstoni*, sp. n. Right valve, × 3. Lower Ludlow, Millichope (Sedgw. Mus.).
*Fig.* 3. *Rhytimya* (?) *lineata*, sp. n., × 2½. Upper Ludlow, Whitcliffe (D. *g.* 43 (2), Ludlow Museum).
*Fig.* 3 *a.* Ditto. Portion of surface of same specimen, × 10.
*Fig.* 4. Ditto. Anterior view of another specimen, × 1⅓. Upper Ludlow, Maryknoll, Ludlow (D. *g.* 43 (5), Ludlow Museum).
*Fig.* 5. *Lunulicardium relegatum*, sp. n. Left valve, × 2. Upper Ludlow, Whitcliffe, Ludlow (D. *g.* 48, Ludlow Museum).
*Fig.* 6. *Endodesma* (?) *protractum*, sp. n., nat. size. Lower Ludlow, locality unknown (D. *d.* 77, Ludlow Museum).

### PLATE IX.

*Fig.* 1. *Tancrediopsis ludensis*, sp. n. Left valve, × 3. Lower Ludlow, Elton Lane, Ludlow (D. *d.* 65 (3), Ludlow Museum).
*Fig.* 1 *a.* Ditto. Cardinal view of same specimen, × 2.
*Fig.* 2. *Pterinea nupera*, sp. n. Left valve, × 2. Upper Aymestry, Wigmore Road, Ludlow (D. *f.* 19, Ludlow Museum).
*Fig.* 3. Ditto. Another left valve, × 2. Same horizon and locality (D. *f.* 19, Ludlow Museum).
*Fig.* 4. Ditto. Another left valve, × 2. Same horizon and locality (D. *f.* 19, Ludlow Museum).
*Fig.* 5. *Euthydesma? (Sulweyia) subobliquatum*, subgen. et sp. n. Right valve, × ¾. Lower Ludlow, Mocktree (D. *d.* 73 (1), Ludlow Museum).
*Fig.* 5 *a.* Ditto. Portion of surface of same specimen, × 5.
*Fig.* 5 *b.* Ditto. Inner side of cardinal region of same specimen, showing ligamental area, × 1½.
*Fig.* 5 *c.* Ditto. Anterior marginal view of same specimen, × ¾.
*Fig.* 6. Ditto. Left valve of another specimen. Nat. size, same locality and horizon (D. *d.* 73 (3), Ludlow Museum).

# XLI.—*Descriptions of new Non-marine Mollusca from North, South, and Central Africa, with Notes on other Species.* By M. Connolly.

[Plate X.; Plate XI. figs. 1–7; Plate XII.; Plate XIII. figs. 24–27.]

Since the publication of my last general papers on this fauna*, a good many new species and varieties have come to hand from all parts of the Continent, the majority being contained in the fine collection made by Dr. G. D. Hale Carpenter in Uganda and neighbouring districts, of which he has kindly presented the cream, including all types, to the British Museum; a few notes on distribution and synonymy may also be worthy of record, and I must express my thanks to Colonel Peile for figures of and notes on the radulæ.

For the convenience of those students who confine their attention to particular districts I divide the following remarks into three main geographical sections.

## I. North Africa.

### Family **Pupillidæ**.

### Genus Orcula, Held, 1837.

### *Orcula tomlini*, sp. n. (Pl. X. fig. 1.)

Shell small, cylindrical, rimate, thin, silky, translucent, corneous brown. Spire produced, sides straight and parallel, summit (4 whorls) bluntly conic. Whorls 8, almost flat, gradually increasing, protoconch (1¾ whorls) engraved to the apex with close, regular, microscopic spiral grooving, remainder sculptured with fairly close and regular, slightly curved and oblique transverse striæ; suture simple, shallow. Aperture subquadrate, rounded at base, peristome white, glossy and reflexed; dentition 7-fold; an acute, deeply inrunning lamella on the centre of the paries, with two large rounded tubercles, thickening outwards in the direction of, but not touching, the ends of the peristome; two prominent inrunning lamellæ, arising on the outer margin of the columellar lip, ½ and ¾ way up the columella, and two narrower ones deep-set above them; columella erect, margin rather narrowly reflexed.

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* Ann. & Mag. Nat. Hist. iii. (1929) pp. 165–178, and Proc. Malac. Soc. xix. (1930) pp. 37–48.

Long. 6·3, lat. 2·7; apert. alt. 1·0, lat. 1·0; last whorl 3·5 mm.

*Hab.* Tripoli: Cyrenaica, N. of Merj (*J. W. Gregory*).

Type in coll. Tomlin.

Two specimens, the second measuring 6 mm. in length and lacking one of the smaller immersed lamellæ at the top of the columella.

The feature which appears to separate this species from all other known *Orculæ* is the presence of the small tumuli on the paries; they are exactly similar in both examples, and can hardly represent an ordinary callous process, since, despite their size, they neither connect with the parietal lamella nor with either end of the peristome.

Something of this kind is present on *O. orientalis*, var. *nitida*, Mouss., and *moussoni*, Reinh., both from Aleppo, but the tubercles are smaller and are connected with the margins. In *Orcula tomlini* the two lower columellar lamellæ are extremely conspicuous.

I have much pleasure in naming this beautiful species in honour of its owner, in grateful recognition of the courteous and ever-ready help and advice in many branches of science, for which countless students besides myself are indebted to him.

## II. SOUTH AFRICA.

### Family Acavidæ.

### Subfamily *DORCASIINÆ.*

### Genus TRIGONEPHRUS, Pilsb., 1905.

### *Trigonephrus lucanus* (Müll.).

### Var. ex forma *nana*, nov. (Pl. X. figs. 6–8.)

1915. *Trigonephrus*, sp. 3, Conn., Ann. S.A. Mus. xiii. p. 176.

The two little shells to which I can now assign a varietal name are those ascribed by Layard (*l. c.* p. 146) to *T. globulus*, Müll., and treated as dubious by myself on p. 176 of the above-cited paper; but the recent occurrence of an example, hardly larger than themselves, from north of the Langebergen, Cape Province, renders it clear that they represent merely a small form of *lucanus*, apparently worthy of varietal rank.

The variety differs from type in its much smaller size for the same number (4½) of whorls; the shell is therefore much compressed and of comparatively greater altitude, while the umbilicus is narrower and more strangulate. The colour is faded brown above, paler beneath, and the peristome white and glossy.

Diam. maj. 19·5, min. 15·5; alt. 16·2; apert. alt. 10·5, lat. 9·0 mm.; ends of paries 5·7 mm. apart.

*Hab.* Namaqualand (ex coll. E. L. Layard).

Type in my collection.

The normal form of *lucanus* measures about 29·2 × 23·2 mm. in diameter, alt. 20, apert. 16·7 × 13 5, and ends of peristome 7 mm. apart; the small specimen from the Langeberg District shows diam. maj. 22·1, min. 19·0; alt. 19·7; apert. alt. 13·0, lat. 8·9 mm.; ends of peristome 4·5 mm. apart.

### *Trigonephrus haughtoni*, sp. n.

1926. *Trigonephrus rosaceus*, Müll., Wenz in Kaiser, Die Diamantenwuste Sudwestafrikas, ii. p. 155 (part 1), pl. xxxix. figs. 1–2.

1930. *Trigonephrus rosaceus*, Conn., Ann. S. Afr. Mus. xxix. pp. 284, 286, fig. 1.

*Hab.* Namib, S.W. Africa. (*a*) Recent: Bogenfels Diamond Fields (type, *L. J. Spencer*); Orange Mund (*Haughton*); Buntfeldschu, E. Bogenfels (*Kaiser & Beetz*). (*b*) Fossil: Vlei, S. of Lochkuppe, Klingharal Gebirge; Elfertstafelberg; Feld Lubeck, 12 km. S.E. of Luderitzbucht (*Kaiser & Beetz*); Orange Mund and Alexander Bay (*Haughton*).

Type in British Museum.

The large series collected by Haughton confirm my suggestion (*l. c. supra*) that this species is distinct from *rosaceus*. Its colour is dark brown, with a few pale streaks and patches at irregular intervals, its spire exserted and its aperture drooping, whereas *rosaceus* is pale rose in colour, with depressed spire and far more horizontal aperture. The sculpture resembles that of *rosaceus* in its transverse striation, with peculiar, strong crinkles between the striæ, but the former is stronger and the latter closer, whence it remains that the only point in which the two species actually agree is the roseate peristome and columellar region.

As in most of this genus the peristome may be either normally reflexed, as in the type, or thickened backwards externally for a considerable distance. The type measures 32·4 × 29·8, apert. 18·5 × 14·0 mm., while Haughton's recent shell from Orange Mund measures 39 × 28, apert. 21 × 17 mm., and the smallest fossil from Alexander Bay 35·3 × 24·1, apert. 18·2 × 16·6 mm.

## Family **Endodontidæ**.

### Genus TRACHYCYSTIS, Pilsb., 1893.

### *Trachycystis approximans*, sp. n. (Pl. X. figs. 2–4.)

Shell of medium size, depressed globose, subrimate, thin, silky, corneous red-brown. Spire moderately exserted, each whorl clearly visible above the next, apex blunt. Whorls 5, gradually increasing, moderately convex, rounded at periphery, the first 1½ smooth, next ½ nearly so, remainder covered all over with fine, close, regular, nearly straight and scarcely oblique transverse costulæ, the narrow intervals filled with from 4 to 6 extremely fine microscopic striolæ, the whole crossed by even weaker spiral grooves, only visible under artificial light at a magnification of over fifty; suture simple, impressed. Aperture semilunar, peristome simple, acute, labrum straight, hardly receding in profile, columella short, weak, concave, margin extremely narrowly and almost adnately reflexed, practically obscuring any perforation.

Diam maj. 7·0, min. 6·2; alt. 5·1; apert. alt. 4·0, lat. 4·0 mm.

*Hab.* Cape Province: George Bush (type) and Keurboom River Bush (*Barnard*).

Type in South African Museum.

Extremely near to *Trachycystis ænea* (Krs.) (=*burnupi*, M. & P.), in which, however, the costulæ are rather more curved and oblique and the shell is of yellow or greenish colour and always more or less umbilicate, and the same remarks apply, to some extent, to its relation to *T. spissicosta*, M. & P. The costulation is far finer than in the early whorls of *T. hartvigiana*, Pfr., of which the new species might have otherwise been considered merely an immature form.

## Family **Pupillidæ**.

### Genus FAUXULUS, Schauf., 1869.

### *Fauxulus fryanus* (Bs.). (Pl. X. fig. 11.)

1864. *Pupa fryana*, Bs., Ann. & Mag. Nat. Hist. xiii. p. 495.

As this almost unknown species has never been figured, I illustrate an example in my collection gathered by Layard at Bredasdorp. The aperture is tubular and particularly remarkable for the basal canal, which continues as a sharp strong keel around the wide deep umbilicus, while, owing to the apertural prolongation, two of the lamellæ are so deep-set as to be hardly visible; the sculpture also is remarkable, consisting after the first two whorls of close, coarse, curved oblique costæ, which are cut from the sixth whorl onward by particularly strong close spiral grooves; the pale lilac hue of the lower whorls is another unusual feature.

### *Fauxulus barnardi*, sp. n. (Pl. X. fig. 5.)

Shell sinistral, rather small, subfusiform, rimate, slightly silky, rather glossy, corneous reddish-brown. Spire produced, sides convex, apex mammillate. Whorls 8, not very convex, increasing very gradually until the last, which is narrower than the one before it; the first smooth, remainder sculptured with close, fine, slightly curved oblique striæ; suture simple, well defined. Aperture subquadrate, peristome just free, expanded and continuous, lips vertical in profile, dentition 7-fold; a strong, slightly incurved, inrunning parietal lamella, arising in the central of the paries; a similar angular lamella arising on the edge of the labrum; two blunt denticles, the lower slightly larger, close together halfway down the labrum; a strong inrunning lower palatal fold; a small tubercle about the centre of the base and a very prominent, descending, inrunning columellar lamella.

Long. 4·7, lat. 2·6; apert. alt. 1·7, lat. 1·7; last whorl 2 2 mm.

*Hab.* Cape Province: Keurboom River Bush (*Barnard*).

Type in South African Museum.

Three examples, all mature and alike; while bearing no resemblance whatever to *F. capensis*, *burnupianus*, *pamphorodon*, *fryanus*, or the dextral *layardi* and *crawfordianus*, they are easily distinguishable from *falconianus*, *mcbeanianus*, *glanvilleanus*, *ponsonbyanus*, and *pereximius* by having only a single process on the columella, whereas the others have two or more.

## Genus CAFFERIA, Simpson, 1900.

### *Cafferia caffra* (Krs.).

1848. *Unio caffer*, Krs., Sudafr. Moll. p. 18, pl. i. fig. 14.
1910. *Unio mashonæ*, Prest., Ann. & Mag. Nat. Hist. vi. p. 61, pl. iv. fig. 10.

Krauss' species was described from Natal and is generally distributed throughout South Africa; it is somewhat variable, and perhaps some of its local races merit varietal or subspecific rank, but the type set of *mashonæ*, from Eukeldoorn District, Mashonaland, contains no example that cannot be matched exactly in any series of absolutely typical *caffra*, and there are no grounds whatever for retaining Preston's name.

### Family **Cyrenidæ**.

### Genus PISIDIUM, C. Pfr., 1821.

### *Pisidium costulosum*, sp. n. (Pl. XIII. figs. 21–27.)

Shell very small, roundly trigonal, the broad prominent umbones smooth, white and glossy, remainder dull milky white, sculptured with strong, close, coarse, regular concentric costæ; all margins regularly arcuate, posterior very short and steep, anterior about twice as long, with gentler slope and narrower curve.

Interior:—Right valve: upper anterior lateral very short and narrow; lower short but strong, obtusely triangular; cardinal tooth bluntly rounded; both posterior laterals strong, upper nearly two-thirds as long as the lower.

Left valve: anterior lateral long, straight and strong; upper cardinal long, straight and narrow, about parallel to the posterior slope of the lower, which is bluntly rounded; posterior lateral weak and narrow.

Long. 2·95, alt. 2·45 mm.

*Hab.* Orange Free State: Rustfontein (*Connolly*).

Type in my collection.

While the shell is of rather distinctive contour, the lateral teeth are strong and the cardinal weak in comparison with most African *Pisidia*, while the strong costulation adds to its distinctness; that this feature is not due to abnormal conditions is proved by the fact that *Pis. langleyanum*, M. & P., which was collected in company with it, showed merely its normal fine concentric striation.

## III. CENTRAL AFRICA.

### Family **Streptaxidæ**.

### Genus GULELLA, Pfr., 1856.

### *Gulella devia*, sp. n. (Pl. X. fig. 10.)

Shell very small, rimate, cylindrical, thin, smooth, glossy, transparent, pale olivaceous. Spire produced, sides straight and parallel, apex bluntly rounded. Whorls 6½, not very convex, apical 2½ rapidly increasing, remainder equal in width and increasing extremely slowly in vertical height; the only sculpture consists of a very few irregular, nearly straight vertical growth-lines; suture very shallow, margined within. Aperture quadrate, rounded at base, peristome slightly thickened, hardly reflexed, outer lip slightly angulate forward in profile, dentition four-fold; a straight detached lamella, slightly inclined to the right, nearly in the centre of the paries; a strong, blunt, conical denticle, corresponding to an external depression, on the angulation halfway down the labrum; a low broad tubercle at the base of the concave columella and a lower one near the top; columellar margin reflexed, forming a small rima.

Long. 3·9, lat. 1·5; last whorl 1·5 mm.

*Hab.* Uganda: Bugishu District, Mt. Elgon, 7000–9000 feet (*Hale Carpenter*).

Type in British Museum.

In eleven apparently mature examples ten show the weak upper columellar tumulus, somewhat similar to that of the type, but in the eleventh this feature is larger and prolonged upward, so as to resemble that usually encountered in the genus; I am inclined to think, however, that this may be due to senility and that the normal form is that as described for the type.

I am unable to find anything quite approaching this little species; its unusual features are, firstly, the parietal lamella being central, having no connection with the outer lip, and, secondly, the breadth of the tubercle at the base of the columella.

It bears rather close resemblance to the figure of *G. lamollei* (Germ.) *, but in that species the parietal lamella is described as prolonged upward so as to constitute a canal-like excision on the right margin of the aperture, the labral denticle as somewhat inset and situate nearer the base than in the Bugishu shell, and there is no mention of an upper columellar process.

The sculpture of the new species is far weaker than that of *G. varians* (Smith) †, and its dentition is somewhat different; it has recently been introduced, by unknown agency from an unknown locality, into the Royal Botanic Gardens, Edinburgh, where examples have been collected by R. Waterston.

### *Gulella carpenteri*, sp. n. (Pl. X. fig. 9.)

Shell of moderate size, narrowly acuminate ovate, rimate, thin, silky, transparent, pale olivaceous. Spire produced, sides slightly convex, apex broadly conical. Whorls 9, nearly flat, gradually increasing, the apical two engraved with very faint, close, regular, microscopic spiral lines, remainder sculptured with strong, close, regular, nearly straight and vertical costulæ, which become finer and closer just behind the labrum; suture shallow. Aperture quadrate, rounded at base, peristome expanded. dentition 5-fold; a strong curved angular lamella, which does not quite connect with the top of the labrum; a bituberculate tooth, corresponding to a narrow external well, halfway down the labrum; a small denticle at the centre of the base and a broad superficial slab halfway up the columella; callus very thin.

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* Bull. Mus. Paris, xvii. 1911, p. 232.

† P. Z. S. 1899, p. 581.

Long. 7·8, lat. 3·3; apert. alt. 1·7, lat. 1·3; last whorl 4·0 mm.

*Hab.* Uganda: N. Bugishu District, as above (*Hale Carpenter*).

Type in British Museum.

The presence of the superficial slab, instead of the usual columellar processes, is most unusual; *Gulella lobidens*, Thiele*, appears to show it, but the other dentition is entirely different.

### *Gulella excruciata*, sp. n. (Pl. XI. fig. 4.)

Shell rather large, acute tun-shaped, rimate, thin, smooth, glossy, transparent, olivaceous. Spire somewhat produced, sides slightly convex, apex broadly conical. Whorls 6½, nearly flat, rapidly increasing in breadth until the fifth, which is slightly broader than the last, sculptured almost to the extreme apex with faint irregular growth-lines, which become close and stronger near the aperture, but vary in strength in individual shells; under high magnification there are visible extremely faint close spiral lines; suture simple, shallow. Aperture subquadrate, peristome white, glossy, narrowly reflexed, labrum straight and nearly vertical in profile, dentition 5-fold; a strong, deeply entering, incurved angular lamella, two labral denticles, corresponding to an external pit, the lower being much the longer and the upper very small and sometimes absent; a small denticle at the centre of the base and a large triangular columellar lamella, indented on its upper surface.

Long. 13·9, lat. 7·6; apert. alt. 4·0, lat. 3·8; last whorl 8·5 mm.

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* Wiss. Ergebn. d. Z.-A.-Exp. iii. 1911, p. 178, pl. iv. fig. 10.

*Hab.* Uganda: N. Bugishu District, Mt. Elgon, 7000–9000 feet (type); Bwamba Pass, Ruwenzori (*Hale Carpenter*). Kenya: Ndarugu R. Valley (*Harries*); Taru Desert (*Percival*).

Type in British Museum.

A small edition of *G. porcina* mihi, but lacking the immersed labral slab which is a constant feature of that huge species. *G. haullevillei* (Dautz. & Germ.) appears to be smaller and comparatively much narrower, with straighter sides and more convex whorls, as well as a mid-parietal denticle.

This widely distributed and conspicuous species has been known to me for some years, but its superficial resemblance to Thiele's figure* of *G. cruciata* (Mts.) deterred me until recently from fuller investigation. Dr. Rensch kindly informs me that it is quite distinct from that or any other species in the Berlin Museum, and Dr. Pilsbry that it is quite unknown to him, while I have been unable to trace it in literature or the collections available to me for reference in England.

## Family Vitrinidæ.

### Genus VITRINA, Drap., 1801.

### *Vitrina variopunctata*, sp. n.

(Pl. XI. figs. 1–3, and text-fig. 1.)

Shell very small, oval, imperforate, thin, smooth, glossy, transparent, pale olivaceous. Spire nearly flat. Whorls 2¼, rapidly increasing, pitted from the apex nearly to the aperture with innumerable punctate dots, very close together but quite unmethodically arranged, which are plainly visible through the interior of the shell; nearing the aperture the dots cease and give place to close waved spiral wrinkles; suture simple, shallow. Aperture suboval, peristome simple, acute, columella short and concave.

Diam. maj. 5·9, min. 4·2; alt. 2·4; apert. alt. 1·8, lat. 4·2 mm.

*Hab.* Uganda: North Bugishu District, Mt. Elgon, 7000–9000 feet (*Hale Carpenter*).

Type in British Museum.

I cannot trace any species with the peculiar punctate sculpture described above, but the extent of punctation varies in almost every example of a fairly long series, of which the type is the largest and most extensively pitted shell. In others the pitting fails sometimes soon after the earliest whorls, or is nearly as widespread as in the type, but in all cases when it ceases the spiral wrinkles take its place, crossing microscopic transverse wrinkles of growth.

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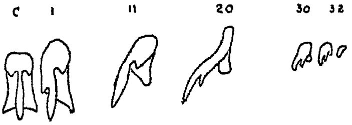
* Wiss. Ergebn. d. Z.-A.-Exp. iii. 1911, pl. iv. fig. 17.

The radula figured has seventy-five rows of teeth (+nascent) with formula 22.10.1.10.22. Central and admedians are tricuspid to line 10; the marginals pass rapidly to the form shown in the figure as no. 20, whence they diminish gradually in size towards the margin, where the outermost lines are rudimentary.

Text-fig. 1.



*Vitrina variopunctata*, Conn. Representative teeth from radula.

The jaw is structurally rather feeble, of the usual lunate shape, with prominent central projection. It is interesting to note the close resemblance between this radula and that of *Vitrina lactea*, Conn. (Ann. & Mag. Nat. Hist. xv. 1925, p. 461).

## Family **Achatinidæ.**

### Genus EUÆTHIOPS, Clench & Archer, 1930.

(Occ. Papers, Boston Soc. N. H. v. p. 295.)

Genotype, *E. loveridgei*, C. & A. (*l. c.* p. 298, pl. xvi. fig. A).

### *Euæthiops obtusa*, sp. n. (Pl. XII. figs. 10–12.)

Shell large, elongate acuminate ovate, imperforate, comparatively solid, glossy, nearly semitransparent, ground-colour deep olive-buff, with vertical flames of deep chestnut, which vary in breadth in individual shells, and in some cases are extremely faint; columellar region and interior for some distance bluish white. Spire moderately produced, sides convex, summit dome-shaped. Whorls 6, convex, rounded at the periphery, the first two extremely small, remainder regularly and rapidly increasing, sculptured on the upper part almost to the extreme apex with coarse, close, regular, slightly waved, nearly vertical growth-wrinkles, which are cut into irregular oblong granules by nearly as close spiral lines; below the suture the spiral sculpture is almost absent, merely imparting a frosted aspect to the spaces between the growth-wrinkles; suture simple, well defined. Aperture biacuminate ovate, peristome glossy white, slightly but distinctly thickened, labrum slightly recurved in profile, columella vertical, strongly truncate at base.

Long. 62·0, lat. 27·9; apert. alt. 28·1, lat. 14·9; last whorl 45·5 mm.

*Hab.* Uganda: North Bugishu District, Mt. Elgon, 7000–9000 feet (*Hale Carpenter*).

Type in British Museum.

It is indeed remarkable that this magnificent genus, so easily distinguished among African Achatinidæ by reason of the glossy white thickening of the peristome, should have remained unknown to science until last year, and then have produced as many as two species from widely distant localities. *E. loveridgei* was collected at Bagili in Tanganyika Territory, and Dr. Clench kindly informs me that it differs from *obtusa* in proportionally longer aperture, practical absence of granulation, the presence of a narrow subsutural band of rather heavy transverse sculpture, and a narrower and more pointed apex.

## Genus Homorus, Albers, 1850.

### *Homorus ellioti* (Smith). (Pl. XII. figs. 1–3.)

1895. *Achatina ellioti*, Smith, Proc. Malac. Soc. i. pp. 323 (fig. 5), 325.

This fine species, which bears little resemblance to an *Achatina*, was founded on a single specimen, 37·7 × 13·5 mm., from Lake Edward; but it attains greater size, the largest of a series collected by Hale Carpenter in the Toro District (Pl. XII. fig. 1) measuring 46·4 × 14·4 mm. The typical coloration consists of broad flames of blackish brown, almost obscuring the buff background, but in some individuals (Pl. XII. fig. 3) the flames are paler and narrower, so that the ground-colour predominates.

The shell is glossy, with little trace of spiral sculpture, and in so far as yet known appears to be confined within the extreme south-western district of Uganda.

### *Homorus malleatus*, sp. n. (Pl. XII. fig. 4.)

Shell large, imperforate, acute turriform, solid, matt, translucent, deep buff with vertical flames and patches of deep chestnut. Spire produced, sides straight, apex acutely mammillate. Whorls 9, nearly flat, regularly increasing, bluntly angled at the periphery when immature, first $1\frac{1}{4}$ white and smooth, remainder sculptured with faint, coarse, regular growth-wrinkles, and covered with close, irregular, microscopic, punctate malleation; suture simple, shallow. Aperture acuminate ovate, peristome simple, acute, labrum almost straight and vertical in profile, columella white, slightly concave, obliquely truncate at base, callus white and continuous.

Long. 40·0, lat. 13·7 ; apert. alt. 13·4, lat. 7·0 ; last whorl 23 mm.

*Hab.* Uganda : North Bugishu District, Mt. Elgon, 7000–9000 feet (*Hale Carpenter*).

Type in British Museum.

All but one of the series, in whatever stage of growth, exhibit a pale patch on the front of the aperture, as mentioned by Pilsbry in the case of his *H. osborni**, which agrees in many other details with the present species, but they differ somewhat in form, and the summit of *osborni* is said to be round and very blunt, whereas in *malleatus* it is most acutely mammillate.

*H. ellioti*, Smith, differs in having a slightly less acute apex and a glossy surface, without the peculiar malleation of the new species.

### *Homorus princeps*, Prest.

1910. *Homorus princeps*, Prest., Proc. Malac. Soc. ix. p. 168.

This fine species, described from Harar, has also been collected by Hale Carpenter in the North Bugishu District, an important fact in conjunction with the habitats of the new *Bocageia* described on p. 319 and the recent discovery of *Gulella simplicima* (Prest.) † in two localities in Abyssinia, as beginning to establish connection between the land-shells of that country and those of the high regions of British East Africa.

### *Homorus velutinus*, sp. n. (Pl. XI. figs. 6 & 7, and text-figs. 2 & 3.)

Shell rather large, imperforate, elongate turriform, rather solid, velvety, just translucent, apical whorl corneous yellow-brown, remainder black-brown, interior pale blue. Spire produced, sides regular, apex mammillate. Whorls 10, moderately convex, regularly increasing, the last rounded at the periphery, protoconch, nearly 4 whorls, sharply angled at the periphery, sculptured to the apex above the suture with coarse, close, regular spiral costulæ, smooth and glossy on the base; the spiral sculpture continues on the fifth whorl, which bears narrow red flames and, for a short distance near its end, strong, close, vertical striæ. The last five whorls are covered with a thick dark epidermis of woolly appearance, with strong, close, regular, nearly vertical wrinkled striæ, on which are arranged close, regular, spiral lines of short hairy bristles, which appear to the naked eye like continuous spiral costæ and render the shell soft to the touch; suture simple, shallow. Aperture acuminate ovate, peristome simple, acute, labrum straight and receding slightly in profile, columella concave, strongly truncate at base.

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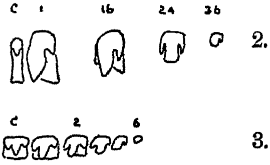
* Bull. Amer. Mus. N. H. xl. 1919, p. 123.

† See P. Z. S. 1928, p. 164.

Text-figs. 2 & 3.



*Homorus velutinus*, sp. n.

Text-fig. 2.—Adult: representative teeth from the radula.
Text-fig. 3.—Embryo: twentieth row of radula.

Long. 34·3, lat. 10·4; apert. alt. 9·2, lat. 5·0; last whorl 15·4 mm.

*Hab.* Uganda: North Bugishu District, Mt. Elgon, 7000–9000 feet (*Hale Carpenter*).

Type in British Museum.

So far as yet observed the species is viviparous.

The type is rather above the average size, but the largest example measures 39·1 × 11·1 mm.; the shell is sometimes more slender by about 1 mm. than the normal form.

The extraordinary cuticle, with its spiral ridges of scale-like fringe, which covers this beautiful shell would have led me to place it next to *Petriola marmorana* (Rve.) (=*barbigera*, Morel.), which it closely resembles in all respects but the important one that in *Petriola* the summit is conical, not in the least mammillate, whereas in the present species it is much produced, terminating in a narrow distorted mamma.

The adult radula figured measures 3 × 1 mm. when flattened out. Formula $38 . 1 . 38 \times (77 + n)$. The laterals resemble the admedian up to line 12, outside which an endocone presents itself. Marginals are tricuspid except in a few outer degenerate lines.

The jaw measures 1 mm. across the curve. It exhibits rather coarse fore-and-aft ribbing with fine intermediate striæ.

The embryo radula selected for figuring is in rather an early stage of development, having thirty-six rows (of which the front six are formless) plus about the same number of nascent rows.

Formula 3 . 1 . 3 at distal end and 7 . 1 . 7 at nascent end respectively.

The teeth differ in form from those of the adult, as is the case in several allied genera (*vide* Proc. Malac. Soc. xviii. p. 268, and xix. p. 81). Tricuspid centrals persist to about row 25, after which the bases begin to elongate. The form of the adult central seems to appear in the unstained nascent portion.

### Genus NOTHAPALUS, Mts., 1897.

### *Nothapalus innotabilis*, sp. n. (Pl. XI. fig. 5.)

Shell of fair size, turriform, imperforate, thin, smooth, glossy, transparent, pale corneous yellow. Spire produced, sides very slightly convex, apex narrowly rounded. Whorls 6½, rather flat, regularly increasing, first 2½ devoid of transverse striation, but showing *extremely* faint, fine, close microscopic spiral lines, hardly visible under 50-fold magnification; remainder with very faint, nearly straight and vertical growth-wrinkles, stronger and recurved for a short distance below the shallow simple suture. Aperture subovate, peristome simple, acute, labrum very slightly curved and gradually receding in profile, columella nearly straight, narrowly truncate at its base.

Long. 17·0, lat. 6·3; apert. alt. 6·0, lat. 3·4; last whorl 10·6 mm.

*Hab.* Uganda: Bwamba Pass (type, *Hale Carpenter*); Fort Portal (*Mrs. Fisher*).

Type in British Museum.

Dr. Pilsbry has kindly compared this species with those known to him from Ruwenzori, and writes:—"Your *Nothapalus* from Bwamba differs from *N. ptychoraphe* * by its more obese shape, the angle of spire outlines wider, but the aperture is narrower, the columella decidedly less concave; I think it is a distinct species."

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* Bull. Amer. Mus. N. H. xl. 1919, p. 132, pl. xix. fig. 4.

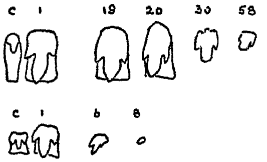
## Genus Bocageia, Girard, 1893.

### Subgenus Liobocageia, Pilsb., 1919.

### *Bocageia carpenteri*, sp. n. (Pl. XII. fig. 5, and text-figs. 4 & 5.)

Shell large, imperforate, inversely subulate, solid, smooth, glossy, translucent, shading from palest buff at the apex to deep chestnut-brown, as in the type, or more rarely yellow-brown, on the later whorls, with occasional irregular lighter or darker streaks; interior and columellar region bluish white. Spire produced, apex bluntly rounded. Whorls 6, convex, rounded at the periphery, the first minute, remainder increasing rapidly in length and gradually in breadth, the first two smooth, remainder sculptured with very faint, close, regular, straight, nearly vertical striolæ, recurved immediately below the suture, which is simple and well defined. Aperture short, acuminate ovate, peristome simple, acute, outer lip slightly recurved in profile, columella very slightly concave, narrowly truncate near the base of the shell and merging upwards in a thin parietal callus.

Text-figs. 4 & 5.



*Bocageia carpenteri*, sp. n.

Text-fig. 4.—Adult: representative teeth from the radula.
Text-fig. 5.—Embryo: representative teeth at ninth row.

Long. 46·5, lat. 15·9; apert. alt. 15·0, lat. 12·5; last whorl 27·2 mm.

*Hab.* Uganda: North Bugishu District, Mt. Elgon, 7000–11,000 feet, the type and finest examples from the higher altitudes (*Hale Carpenter*); Tororo District (*Fisher*); Abyssinia: Baka Mts., Kaffa (in Berlin Museum).

Type in British Museum.

The largest example has been selected as type, but one less than 31 mm. in length, of which the radula is illustrated, was full of fry; these show spiral lines cutting the growth-wrinkles on the third whorl, which soon vanish, however, as the shell matures, and do not persist on the later whorls of the embryo.

The figure of *B. germaini*, Pilsb.*, might well be mistaken for the present species, since there is, unfortunately, nothing in the diction or explanation of the plate to indicate that the figure is greatly enlarged ; Pilsbry states that his *germaini* measures about 25 × 9 mm., in 6½ whorls, so there can be no specific connection between them.

This is the species referred to in Proc. Malac. Soc. vol. xviii. p. 268. The adult radula figured measures 4 × 2 mm. when flattened out.

Formula 61.1.61 × (100 + *n*). The laterals begin to change into more degenerate marginals at about line 26 ; the outer marginals are very weak.

The jaw measures 2 mm. across the curve ; it shows the fine fore-and-aft ribbing usual in Achatinidæ with occasional stronger folds.

The embryo radula selected for figuring is well developed, having 74 rows (+ nascent), with formulæ 6 . 1 . 6 at distal end and 21 . 1 . 21 at nascent end respectively. The central tooth is noticeably tricuspid to row 30 from the front ; thence a gradual change over the next 30 rows leads to the adult form behind row 60.

## Family Tiaridæ.

### Genus Goodrichia, Clench, 1929.

*Goodrichia dykei* (Spence). (Text-figs. 6 & 7.)

1925. *Thiara* (*Melanoides*) *dykei*, Spence, Journ. of Conch. xvii. pp. 249, 250, text-fig. 1.

Text-fig. 6 depicts a paratype of this species and text-fig. 7 a large body-whorl, minus spire, which appears referable to it. Combining both together, a fair idea of its probable appearance when mature can be obtained.

## Family Unionidæ.

### Genus Unio, Retz., 1788 (sensu lato).

*Unio introrugatus*, sp. n. (Pl. XII. figs. 6–9.)

Shell small, trigonal, thin, covered with a brilliantly glossy unicoloured epidermis of bronze-green, as in the type, or bronze-brown. Dorsal margin nearly straight and horizontal ; anterior uniformly curved, pallial ventricose opposite the umbones and then sloping rapidly upwards to the posterior margin, so that the latter is very narrowly curved; umbones but little prominent, situate in just over $\frac{1}{3}$ the length of the shell from the anterior margin. Shell-sculpture consisting of regular broad zigzag wrinkles, of so great strength that they are clearly visible *and tangible* all over the interior, arranged in two regular files, trending downwards from each end and forming a sharp angle at the point whence they turn upward to form another small zigzag before meeting about the centre of the shell; in some specimens the short central zigzag is absent; on top of this sculpture the epidermis is covered with close, regular, raised, horny concentric lines of growth, plainly apparent under a weak lens.

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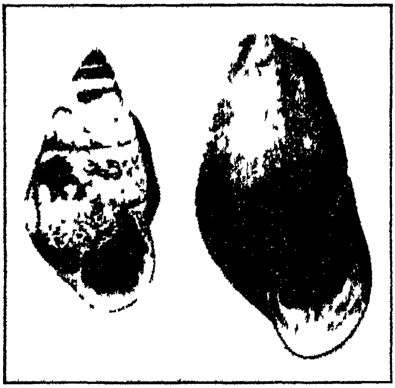
* Bull. Amer. Mus. N. H. xl. 1919, p. 137, pl. xxiii. fig. 9.

Text-figs. 6 & 7.



*Goodrichia dykei* (Spence), × 1.

Interior:—Nacre smooth, of brilliant pale opalescence. Right valve: anterior tooth projecting but little, 5·5 mm. long, narrowly bifid; posterior nearly straight, very narrowly bifid, 12·5 mm. long; A.A. and A.P.R. scars deeply impressed, remaining muscular impressions in *both* valves almost invisible. Left valve: both teeth nearly straight and narrowly bifid, about the same length as in the right valve; A.P.R. merging evenly into A.A. to form with it the apex of an isosceles triangle.

Long. 32·0, alt. 15·3; crass. 11·0 mm.

*Hab.* Uganda: Victoria Nyanza (*Hale Carpenter*).

Type in British Museum.

## XLII.—*The Land-shells of British Somaliland.*

By M. Connolly.

[Plate XI. figs. 8–12; Plate XIII. figs. 1–23.]

### I. Introduction.

The first collector of non-marine mollusca in the province which now bears the above name was the French traveller G. Revoil, who paid it three lengthy visits between the years 1877 and 1881, and whose collections were treated by Bourguignat in two papers in 1881 * and 1882 †.

As this period was long anterior to the partition of the country, which was then almost unknown and unexplored, some doubt must attach as to whether certain of Revoil's localities should be attributed to what is now British or Italian territory; but it is fairly certain that nineteen so-called species hail from that under notice. I leave them for the present in the genera to which Bourguignat assigned them:—

*Bulimus revoili* (cum vars. *cyclostomopsis* and *pachystoma*), *georgi*, *macropleurus*, *pauli*, *bertrandi*, and *delagenieri*, Bgt., and *candidus*, Lam.

*Limicolaria* (sic!) *revoili*, *gilbertæ*, *rochebruni*, *armandi*, *perrieriana*, *maunoiriana*, *milne-edwardsiana*, *leontinæ*, and *rabaudi*, Bgt.

*Georgia naticopsis*, *poirieri*, and *revoili*, Bgt.

In 1882 Ancey ‡ published descriptions of such of Revoil's species, already described by Bourguignat, as had come into his possession, and gave the new name of *moreletianus* to the *Limicolaria revoili* of the other author.

In 1897 Pilsbry § described as from Somaliland four new species of land-shells, but as the localities given by him all appear to be in Abyssinia they need not enter into present consideration.

In 1899 Smith || listed four species collected by F. L. and W. D. James and Dr. Donaldson Smith, these being *Rachis revoili*, Bgt., *G. poirieri*, Bgt., and two new species, *Ennea*

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* "Mollusques terrestres et fluviatiles recueillis . . . dans le pays des Çomalis Medjourtins."

† "Mollusques terrestres et fluviatiles" (in Revoil, 'Faune et Flore des pays Çomalis').

‡ Nat. Sicil. pp. 205–207.

§ Proc. Acad. Nat. Sci. Philad. pp. 357–359.

|| Journ. of Malac. vii. pp. 57–59.

*somaliensis* and *Petræus somaliensis*, Smith; he further remarked that he could see no difference between *Georgia naticopsis, perrieri, poirieri*, and *revoili*, Bgt.

In 1910 Tomlin* described four new species collected by W. Feather at Gan Libbah, namely *Ennea orestias*, *Cerastus boothi*, *C. featheri*, and *Zebrina libbahensis*, Tmln., but did not mention Feather's other finds; and this exhausts the special literature on the subject.

In the course of the last three years Dr. A. W. Macfadyen, of the Somali Petroleum Company, and Mr. C. Barrington Brown, of the Anglo-Italian Boundary Commission, have made small but valuable collections in the central and southern districts, and as four of their species are new to science and others are additions to the fauna, the present occasion seems favourable for placing on record all the data that I can gather about it.

The subjoined list follows the usual systematic routine, and as all the localities are in British Somaliland I do not mention the province in the records.

## II. SYSTEMATIC.

### Family **Streptaxidæ.**

### Genus STREPTOSTELE, Dhrn., 1866.

*Streptostele suradensis*, sp. n. (Pl. XI. fig. 12.)

Shell of fair size, elongate, rimate, thin, silky, semitransparent, pale lacteous olivaceous. Spire much produced, sides nearly straight and parallel for the last five whorls, and then gradually tapering to the mammillate apex. Whorls 11, nearly flat, very gradually increasing, the first three smooth and glossy, remainder covered with faint, close, regular, straight vertical costulæ; suture simple, shallow. Aperture subovate, peristome white, glossy, thickened and very narrowly reflexed, outer lip bluntly angulate and incurved just below the sinus, columellar margin triangularly reflexed, almost obscuring the small rima.

Long. 12·0, lat. 2·5; apert. alt. 1·7, lat. 1·1; last whorl 3·8 mm.

*Hab.* Surad Mountain, Erigavo District, 10° 45′ N., 47° 15′ E., 2200 metres, in open *Juniper*-forest under aloe plants etc. on limestone soil (*Macfadyen*).

Type in my collection.

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* Journ. of Conch. xiii. pp. 54–56.

A very fine species, nearest to *S. lenta* (Smith) and *nyiroensis*, Conn.; the former, however, has flatter whorls and a regularly tapering spire, and the latter is rather broader, with slightly less slowly increasing whorls, while in neither have I yet observed any trace of the well-developed peristomal processes, which are so marked in the new species. The shell varies in length, the smallest adult examples being only 9·7 mm. long.

### Genus GULELLA, Pfr., 1856.

#### *Gulella somaliensis* (Smith).

1899. *Ennea somaliensis*, Smith, Journ. of Malac. vii. p. 58.

*Hab.* Ganlibah Golas Range, 5900 feet (*Donaldson Smith*).

#### *Gulella orestias* (Tomlin).

1910. *Ennea orestias*, Tomlin, Journ. of Conch. xiii. p. 55.

*Hab.* Gan Libbah (*Feather*).

## Family **Zonitidæ**.

### Genus ZONITES, Montf., 1810.

#### *Zonites somaliensis*, sp. n. (Pl. XI. figs. 9–11.)

Shell of fair size, discoid, umbilicate, thin, asperate, semitransparent, somewhat faded corneous yellow. Spire and apex almost flat. Whorls 5, moderately convex, angled at the periphery, regularly increasing, sculptured all over except at the extreme apex with strong, close, regular, slightly oblique, curved transverse costæ; suture subcrenulate, well defined. Aperture horizontally acuminate ovate, peristome simple, acute, imperfect at the lip, columella very weak, concave, margin narrowly reflexed, but not nearing the umbilicus, which is wide and deep, exposing all the whorls.

Diam. maj. 20·0, min. 17·5; alt. 8·0; apert. alt. 6·3, lat. 8·3 mm.

*Hab.* Madashon, Al Hills, 4000 feet (*Barrington Brown*).

Type in British Museum.

A single specimen, semi-bleached, broken at the aperture and possibly immature, but very distinct from anything that I can trace; it bears nearest resemblance to certain members of the large European *Zonites*, from which it differs in being strongly costate on the base instead of smooth and glossy.

### Genus LEDOULXIA, Bgt., 1885.

### *Ledoulxia formosa*, Bgt.

1885. *Ledoulxia formosa*, Bgt., Helixarionidées, p. 14.
1885. *Ledoulxia megastoma*, Bgt., Helixarionidées, p. 14.
1928. *Ledoulxia formosa* (=*megastoma*), Bgt., Conn., Atti Soc. Nat. Modena, lix. p. 119, pl. iii. fig. 2.

*Hab.* Chor Aded; Golol Plateau (*Stefanini*).

Bourguignat's two species, which are completely conspecific, were described from the southern district of Italian Somaliland, and the shells under present notice differ from type in being more strongly keeled, more narrowly perforate, and the protoconch being strongly radially wrinkled, a feature lacking in the southern race; one of the largest measures 19 × 10·9 mm., and has a weak white callus. The localities are so far apart, and so few Zonitoid species appear to have such wide distribution in these regions, that further research may well establish their distinctness.

## Family **Helicarionidæ.**

### Genus VITRINA, Drap., 1801.

### *Vitrina giulettii*, Pollon.

1888. *Vitrina giuliettii*, Pollon., Boll. Mus. Torino, iii. no. 37, p. 2; id. Bull. Soc. Mal. Ital. xiii. p. 58, pl. ii. figs. 4–6, 16.

*Hab.* Surad Mountain (*Macfadyen*).

Described from Garobele, Abyssinia. Several semi-bleached shells appear referable to this species, which, however, is suspiciously like the prior *V. bianchii*, Pollonera.

## Family **Enidæ.**

### Genus PETRÆUS, Albers, 1850.

#### Subgenus EURYPTYXIS, Fischer, 1883.

The microscopic spiral sculpture in this group is very puzzling; Bourguignat states that only two species, *pauli*, Bgt., and the Arabian *fragosus*, Fér., show it, whereas it is apparent on some examples that I have examined of *revoili*, cum vars., and *macropleurus*, though practically indiscernible in two shells before me which agree in all other respects with *pauli*. Subject to this qualification, it has not proved difficult to reduce the French savant's species into what may be proper order.

### *Petræus revoili* (Bgt.).

1882. *Bulimus revoili*, Bgt., Miss. Revoil. p. 27, pl. i. fig. 1.
1928. *Petræus* (*Euryptyxis*) *revoili*, Bgt., Conn., Atti Soc. Nat. Modena, lix. p. 125.

*Hab.* Ouanentab, Ouarsanguelis Mts. (*Revoil*); Marojeh, Al Hills, 3500 feet (*Barrington Brown*); Durfahrli Hill, 10° 02′ N. and 45° 42′ E., 750 metres; Hagrin Scarp, 5 miles N.E. of Hudin, Nogal District, 700 metres (*Macfadyen.*)

This magnificent species, which also inhabits Italian Somaliland, is very variable, and three of the figures given by Bourguignat represent such well-defined forms, which do not often appear to occur together, that they are well retainable under varietal names.

### Var. *cyclostomopsis*, Bgt.

1882. *Bulimus revoili*, var. *cyclostomopsis*, Bgt., *l. c.* p. 28, pl. i. fig. 2.

*Hab.* Hagrin Scarp (*Macfadyen*).

A very obese form; the original localities of this and the following are not mentioned by Bourguignat, but the former is also known from Italian Somaliland.

### Var. *pachystoma*, Bgt.

1882. *Bulimus revoili*, var. *pachystoma*, Bgt., *l. c.* p. 28, pl. i. fig. 3.

*Hab.* Erigavo District (*Macfadyen*).

Rather more slender than the type, with very pronounced peristomatal reflexion.

### Var. *georgi*, Bgt.

1882. *Bulimus georgi*, Bgt., *l. c.* p. 35, pl. i. fig. 4.

*Hab.* Fararale, foot of the Karkar Mts. (*Revoil*); Hagrin Scarp (*Macfadyen*).

Macfadyen's shell agrees perfectly with Bourguignat's figure; it is simply an elongate form of the foregoing with distorted aperture.

### *Petræus candidus* (Lam.).

1822. *Pupa candida*, Lam., Anim. s. vert. vii. pt. 2, p. 106.
1882. *Bulimus candidus*, Lam., Bgt., *l. c.* pp. 16, 28, pl. i. figs. 6–8.
1882. *Buliminus* (*Petræus*) *latireflexus*, Rve., Ancey, Nat. Sicil. i. p. 206.

*Hab.* Valley of the Melo, near Durduri, Ouarsanguelis Mts. (*Revoil*).

Described from Arabia.

Ancey's note on *latireflexus* runs:—"It is to this species, in my mind, and not to *B. candidus* Lam., that one should refer the specimens gathered by Revoil; their peristome is broadly reflexed and rounded, not bordered with fulvous in the interior, which lacks in the columellar region the large acute tooth, terminating the fold, which is found here; the shell is bright brown and smaller than that of *candidus*, Lam."

Not having seen the shells in question, I repeat Ancey's remarks without comment.

### *Petræus macropleurus* (Bgt.).

1882. *Bulimus macropleurus*, Bgt., *l. c.* p. 32, pl. i. fig. 16.

*Hab.* Valley of the Melo, above Durduri (*Revoil*); 10 miles W. of Eruduwe (*Barrington Brown*).

Distinguishable by its strong rather distant costulation; the examples before me agree with the original figure.

### *Petræus bertrandi* (Bgt.).

1882. *Bulimus bertrandi*, Bgt., *l. c.* p. 33, pl. i. fig. 17.

*Hab.* Valley of the Melo (*Revoil*); probably a rather slender form of *macropleurus*.

### *Petræus pauli* (Bgt.).

1882. *Bulimus pauli*, Bgt., *l. c.* p. 37, pl. i. fig. 9.

*Hab.* Gadambar Hill, 10° 06′ N., 45° 40′ E., 800 metres (*Macfadyen*).

Originally described from Italian territory; the Gadambar shells agree in all respects with Bourguignat's figure and description, except for the deficiency of spiral sculpture already mentioned. The shell is of slender contour, rather different from any of the foregoing, and the transverse striation, while far stronger than in *revoili*, is closer and weaker than in *macropleurus*.

### *Petræus delagenieri* (Bgt.).

1882. *Bulimus delagenieri*, Bgt., *l. c.* p. 39, pl. i. fig. 18.

*Hab.* Valley of the Melo, near Durduri (*Revoil*).

It is impossible to determine the relations of this form from the details given by its author.

## Family Pachnodidæ.

### Genus Cerastus, Albers, 1860.

### *Cerastus abyssinicus* (Pfr.).

1845. *Bulimus abyssinicus*, Rüpp., Pfr., Zeitsch. f. Mal. ii. p. 157.

*Hab.* Durfahri Hill; El Gumbe'el, near Jidali, 10° 35′ N., 47° 45′ E., 1350 metres (*Macfadyen*).

Described from Abyssinia, where it is fairly plentiful.

### *Cerastus achatinoides*, sp. n. (Pl. XI. fig. 8.)

Shell of medium size, imperforate, acuminate ovate, thin, transparent, with a silky gloss, corneous yellow. Spire somewhat produced, sides regular, apical angle 60°, apex mammillate. Whorls 6, convex, rounded at the periphery, regularly increasing, the first practically smooth, remainder sculptured all over with close, regular, nearly straight, slightly oblique transverse striæ; suture simple, well defined. Aperture subpyriform, peristome simple, acute, outer lip straight and almost vertical in profile, columella glossy white, concave, strongly obliquely truncate near the base; callus none.

Long. 20·0, lat. 11·5; apert. alt. 11·0, lat. 6·2; last whorl 15·8 mm.

*Hab.* Madashon (type); Marojeh, Al Hills, 3500 feet (*Barrington Brown*).

Type in British Museum.

H. Watson kindly informs me that the anatomy of this species shows it to belong to the Pachnodidæ; so, on conchological grounds, I place it in *Cerastus*, of which, however, it is the only known member with truncate columella. The single example from Marojeh is more slender than type, measuring 19·5 × 9·5 mm.

### *Cerastus boothi* (Tomlin).

1910. *Buliminus* (*Cerastus*) *boothi*, Tmln., Journ. of Conch. xiii. p. 54.

*Hab.* Gan Libbah, 5600 feet (*Feather*).

### *Cerastus featheri* (Tomlin).

1910. *Buliminus* (*Cerastus*) *featheri*, Tmln., *l.c.* p. 54.

*Hab.* Gan Libbah, 5600 feet (*Feather*).

### *Cerastus putealis*, Conn.

1930. *Cerastus putealis*, Conn., Proc. Malac. Soc. xix. p. 46, pl. vi. fig. 8.

*Hab.* Hergawt Hill, E. of Sheikh, 9° 55′ N., 45° 27′ E., 1495 metres (*Macfadyen*).

Distinguishable from others of the *abyssinicus* group by its rather wide deep umbilicus, enclosed by a well-defined basal carination.

### *Cerastus somaliensis* (Smith).

1899. *Buliminus* (*Petræus*) *somaliensis*, Smith, Journ. of Malac. vii. p. 59.

*Hab.* Ganlibah Golas Range, 5900 feet (*Donaldson Smith*).

### Genus Rachis, Albers, 1850.

The local representation of species probably attributable to this genus offers an exceedingly difficult problem, of which, despite very careful study, I am far from confident that my proposed solution is along the right lines.

Bourguignat placed in *Limicolaria* a group of more or less illusory species, of which the shells bear little resemblance to *Limicolaria* and the anatomy is distinct, but their exact generic position is at present doubtful, though possibly assignable to *Rachis*.

Bourguignat divided his "Limicolarias" into two groups, one with rather strong striation and the other nearly smooth, and it appears possible to classify his species in accordance with this specification. The rarity of the sculptured forms, however, until quite recently has prevented proper comparison and caused some confusion in their determination. In adopting the French author's division on sculpture alone I may state that, in so far as I can see, there are no other grounds for their separation, except where hereafter mentioned, and if this salient feature were ignored there would only remain, I think, two species, *Rachis revoili* and *rochebruni* (Bgt.).

### (*a*) Costulate Forms.

### *Rachis revoili* (Bgt.).

1882. *Limicolaria revoili*, Bgt., Faune et Flore Çomalis, p. 42, pl. ii. figs. 24, 25.
1882. *Limicolaria revoili*, var. *inflata*, Bgt., ibid. p. 43, pl. ii. fig. 26.
1882. *Limicolaria gilbertæ*, Bgt., ibid. p. 44, pl. ii. figs. 27, 28.
1882. *Buliminus* (*Rachis*) *moreletianus*, Ancey, Nat. Sicil. i. p. 206.
1889. *Buliminus revoili*, Bgt. (pars), Smith, Journ. of Malac. vii. p. 57.
1928. *Rhachis revoili*, Bgt., Conn., Atti Soc. Nat. Modena, lix. p. 123.

*Hab.* Ouarsanguelis Mts. (*Revoil*); East end Siradleh, 1700 metres, on open limestone downs; junction of Hudin and Burao–Erigavo roads, 9° 01′ N., 46° 44′ E., 700 metres (*Macfadyen*).

Also found in the north of Italian Somaliland.

Bourguignat gives a good figure of this species, emphasizing its costulation; Ancey redescribed, with nearly as strong emphasis on that feature, but renamed it *moreletianus* on the ground that, being a *Bulminus*, it was preoccupied in page precedence by the *Bulimus revoili*, Bgt. Smith, however, rightly points out that this was superfluous, since neither of Bourguignat's *revoilis* had been placed by him in even the same family, and do not belong to the same genus, but was, I think, mistaken in attributing to the species now under review a large series of the smooth form (with which I deal hereafter as *maunoiriana*, Bgt.), mentioning that only two shells before him, from an uncertain locality in Central Somaliland, possessed the costulation that should be present on *revoili*, and which, I may mention, is evident on the type of *moreletiana*, now in Coll. Tomlin, though, being a brilliantly fresh specimen, it is less so than on slightly dulled, weathered examples—a fact which caused me in 1928 to state erroneously that Ancey's name should be applied to the smooth form.

The costulation in *revoili*, though not extreme, can be plainly felt with a finger-tip, and in all the series that I have examined there is no presence of the far commoner smooth form. The coloration is uniform cream, more often narrowly flamed with chestnut, and the contour varies considerably, with every intermediate grade, so that there appears to be little value in *gilbertæ* and *inflata* as varietal names. The dimensions of a few measured specimens are as follows:—

(*a*) Junction of Hudin and Burao–Erigavo Roads:
Shell 22·5×9·1, apert. 9·1×4·0 mm.
22·0×9·2 9·0×4·2

(*b*) Between Balli Icillen and Ina Oskin, Italian Somaliland:
Shell 21·3×8·2, apert. 8·0×3·4 mm.
20·0×8·0 8·5×3·2
20·0×8·0 8·1×3·5
All the above are narrowly flamed.

(*c*) East end Siradleh, range from
Shell 23·4×9·0, apert. 8·3×4·1 mm. to
22·0×9·6 8·2×4·4
Some of this series exhibit *one, two, or rarely more chestnut bands.*

### *Rachis perrieriana* (Bgt.).

1882. *Limicolaria perrieriana*, Bgt., Faune et Flore Çomalis, p. 47, pl. ii. figs. 31, 32.

*Hab.* Ouarsanguelis Mts. (*Revoil*).

Bourguignat's dimensions, 20×7 mm., represent a more slender form than I have seen in this group.

### *Rachis rochebruni* (Bgt.).

1882. *Limicolaria rochebruni*, Bgt., *l. c.* p. 45, pl. ii. figs. 33, 34.

*Hab.* Aircusis, Oursanguelis Mts., 1660 metres (*Revoil*).

### *Rachis armandi* (Bgt.).

1882. *Limicolaria armandi*, Bgt., *l. c.* p. 46, pl. ii. figs. 35, 36.

*Hab.* Mana, Sabe District, Ouarsanguelis Mts., 1500 metres (*Revoil*).

While distinct from any of the foregoing through their more slender fusiform contour, these two forms are probably themselves conspecific.

## (*b*) Smooth Forms.

### *Rachis maunoiriana* (Bgt.). (Pl. XIII. figs. 1–23.)

1882. *Limicolaria maunoiriana*, Bgt., *l. c.* p. 48, pl. ii. figs. 29, 30.
1899. *Buliminus revoili*, Bgt. (pars), Smith, Journ. of Malac. vii. p. 57.

*Hab.* Ouarsanguelis Mts. (*Revoil*) ; Lugat, 4300 feet (*Donaldson Smith*) ; Mandera (*Feather*); El Gumbe'el near Jidali, Erigavo District, 10° 35′ N., 47° 45′ E., 1350 metres ; Gal Gudan Hill, near Sheikh, 5500 feet ; Hergawt Hill ; Surad Mountain ; Erigavo District, without special locality (*Macfadyen*).

This name stands first on the list of Bourguignat's smooth Limicolarias, and appears applicable to the majority of those which follow it. Bourguignat's figure is that of a rather small or immature shell, but can be matched by many now before me, and in a species, or group of races, so liable to polymorphism it is advisable to retain the earliest name. Perhaps no other species exhibits so much variation, within certain partly localized limits, in various series, and were it not that every intermediate occurs in each series, relevant to its own local variation, and that all grade into one another, it would be easy not only to accept all the French savant's names, but to add to them considerably.

This variability extends impartially to contour of shell, length and convexity of whorls, and colour-pattern, which may be either uniform cream, more often streaked with narrow chestnut flames, and in some series in addition, or in place of these, any number from one to nine of narrow brown bands.

I append a few measurements of divergent forms from localities where such predominate, and as the figures are all of actual size I confine my remarks to a minimum :—

| | Long. | Lat. | Apert. alt. | lat. | Colour. |
|---|---|---|---|---|---|
| Mandera .......... | 26·5 | 11·6 | 10·2 | 5·6 | Flamed. |
| | 26·3 | 11·8 | 11·3 | 5·4 | Flamed. |
| | 23·1 | 9·7 | 9·2 | 4·6 | Flamed. |
| | 20·6 | 9·5 | 8·8 | 4·9 | Cream. |
| | 23·3 | 10·3 | 9·5 | 4·5 | Flamed. |
| | 25·3 | 10·1 | 9·4 | 4·7 | Cream. |

The large race well known in collections under the name of *revoili* or *moreletianus*; it comprises most of the biggest examples, though some are more slender and the coloration may be cream or flamed. All are perforate.

| | Long. | Lat. |
|---|---|---|
| El Gumbe'el ...... | 25·8 | 10·6 |
| | 26·8 | 10·5 |
| | 25·4 | 10·5 |

Erigavo District, 1700 metres.

The long series from these localities accord so closely with that from Mandera that no further details are necessary.

| | Long. | Lat. | Apert. alt. | lat. | Colour. |
|---|---|---|---|---|---|
| Hergawt Hill...... | 16·3 | 7·7 | 7·7 | 3·5 | Flamed. |

A single slightly immature shell with obliquely truncate columella.

| | Long. | Lat. | Apert. alt. | lat. | Colour. |
|---|---|---|---|---|---|
| Gal Gudan ........ | 23·5 | 9·5 | 9·3 | 4·2 | Flamed. |
| | 23·6 | 8·7 | 7·6 | 4·0 | Flamed. |
| | 23·3 | 8·7 | 9·6 | 3·6 | Flamed. |
| | 21·0 | 8·6 | 7·5 | 3·7 | Banded. |

Majority somewhat faded; very few unicoloured, but several more or less banded, the bands being intermittent and varying in number.

| | Long. | Lat. | Apert. alt. | lat. | Colour. |
|---|---|---|---|---|---|
| Surad Mountain.... | 27·1 | 9·9 | 9·3 | 4·8 | Banded. |
| | 21·3 | 9·2 | 7·8 | 3·9 | Banded. |
| | 25·3 | 9·9 | 8·5 | 4·4 | Banded. |
| | 22·1 | 9·0 | 7·7 | 4·4 | Flamed. |
| | 19·3 | 7·0 | 6·4 | 3·0 | Banded. |
| | 23·3 | 9·3 | 8·2 | 4·9 | Banded. |
| | 21·1 | 8·5 | 7·1 | 3·6 | Banded. |
| | 19·7 | 7·2 | 6·2 | 2·9 | Banded. |
| | 20·9 | 7·0 | 5·9 | 3·3 | Banded. |

Unicoloured (rare), flamed, or with up to eight or nine narrow bands on last whorl; immature shells often imperforate.

It will be seen that this last series is so full of extremes of variation in regard to slender contour, length and convexity of whorls, and banding that it would seem natural, on the majority of specimens, to found a subspecific and several varietal names; yet some individuals of this series are in complete agreement with some of those from Gal Gudan, whence others agree equally well with some of the large normal race from Mandera, so that every intermediate link exists to complete the chain between the largest, obese, flat-whorled shells of Mandera down to the smallest, slender, convex-whorled extremes from Surad, and it appears impossible to draw a satisfactory line of demarcation.

### *Rachis milne-edwardsiana* (Bgt.).

1882. *Limicolaria milne-edwardsiana*, Bgt., *l. c.* p. 49, pl. ii. figs. 39, 40.

*Hab.* Ouarsanguelis Mts. (*Revoil*).

### *Rachis leontina* (Bgt.).

1882. *Limicolaria leontina*, Bgt., *l. c.* p. 50, pl. ii. figs. 37, 38.

*Hab.* As above.

### *Rachis rabaudi* (Bgt.).

1882. *Limicolaria rabaudi*, Bgt., *l. c.* p. 51, pl. ii. figs. 41, 42.

*Hab.* As above.

Without knowledge of the types it is impossible to determine the validity of the three foregoing species; the figures and dimensions of all seem to fall well within the limits of the various series attributed above to *maunoiriana*.

### *Rachis libbahensis* (Tmln.).

1910. *Buliminus* (*Zebrina*) *libbahensis*, Tmln., *l. c.* p. 56.

*Hab.* Gan Libbah, 5600 feet (*Feather*).

Extremely near *rochebruni*, from which it can only differ in being smoother.

## Family **Pupillidæ**.

### Genus Pupoides, Pfr., 1854.

### *Pupoides cerealis* (Paladh.).

1872. *Bulimus cerealis*, Paladh., Ann. Mus. Genova, iii. p. 16, pl. i. figs. 22, 23; Morel., ibid. p. 201 (as synonym of *cœnopictus*, Hutt.).

1874. *Bulimus cerealis*, Paladh. (as synonym of *fallax*, Say), Jick., Nov. Act. K.L.-C. Ak. Naturf. xxxvii. p. 98.

1889. *Bulimus cerealis*, Paladh. (as synonym of *sennariensis*, Pfr.), Jouss., Bull. Soc. Malac. Fr. vi. p. 356.

1906. *Pupoides cerealis*, Paladh. (as synonym of *sennariensis*, Pfr.), Ancey, Journ. de Conch. liii. p. 263.

*Hab.* Surad Mountain (*Macfadyen*).

Described from Kursi, near Aden.

Morelet placed *cerealis,* together with *sennariensis,* Pfr., and others, in the synonymy of the Indian *cœnopictus,* Hutt., while Jickeli relegated all three to that of the American *fallax,* Say, and subsequent authors, possibly without having seen Paladhille's originals, have attributed it to the synonymy of one or the other.

Comparison of a paratype in the Tomlin collection with an extensive accumulation of Asiatic and African members of the genus seems to render it impossible to unite *cerealis* with any of them, not only by reason of its slender form, but also the greater convexity of its whorls, and I think it well worthy of retention as distinct; *Leucochiloides hoggarensis,* Plry.*, which has recently been described from South Tunis, would appear from the description to agree in all respects except that Pallary's species is said to lack the minute tubercle on the right of the paries which is usual in the genus and present in *cerealis* ; all these shells measure between 4·5 and 4·75 mm. in length and about 2 mm. in breadth.

## Family **Achatinidæ.**

### Genus LIMICOLARIA, Schum., 1817.

### *Limicolaria donaldsoni,* Pilsb.

1897. *Limicolaria donaldsoni,* Pilsb., Proc. Acad. Nat. Sci. Philad. p. 358.
1909. *Limicolaria donaldsoni,* Pilsb., Kob., Abh. Senckenb. Ges. xxxii. p. 23, pl. v. fig. 7.

*Hab.* Garabis Hill, S.W. of Hargeisi (*Macfadyen*).

Described from the Haud, probably across the Abyssinian frontier; though broken and weatherworn, the Garabis shells are easily identifiable with Kobelt's beautiful figure.

### Genus HOMORUS, Albers, 1850.

### *Homorus perlucidus,* Prest.

1910. *Homorus perlucida,* Prest., Proc. Malac. Soc. ix. p. 168.

*Hab.* Gan Libbah (*Feather*).

Described from Harrar.

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* Bull. Soc. Hist. Nat. Afr. Nord, xx. p. 6.

### Genus OPEAS, Albers, 1850.

### Section NOTHAPALINUS, Conn., 1923.

### *Opeas münzingeri* (Jick.).

1873. *Stenogyra munzingeri*, Jick., Mal. Blätt. p. 103.
1874. *Acicula münzingeri*, Jick., Nov. Act. K. Leop.-Carol. Ak. Naturf. xxxvii. p. 133, pl. ii. fig. 3, pl. v. fig. 21.
1883. *Subulina münzingeri*, Jick., Bgt., Ann. Sci. Paris, xv. 2, p. 82, pl. ix. figs. 65–67.
1908. *Subulina münzingeri*, Jick., N. & A., Ann. Sci. Nat. Belg. viii. pp. 304, 305, fig. 18.
1928. *Subulina munzingeri*, Jick., Conn., P. Z. S. p. 241.

*Hab.* Erigavo District (*Macfadyen*).

As mentioned by me in 1928 it is very doubtful whether the specimens then before me from Adda and those figured by N. & A. from Dire-Daua are truly referable to this species; Macfadyen's example, on the other hand, agrees well with that figured by Jickeli; it appears to fall into my section *Nothapalinus*, though whether that is the oldest available name is open to question.

### Genus ZOOTECUS, Wstld., 1887.

### *Zootecus insularis* (Ehrn.).

1831. *Pupa insularis*, Ehrn., Symb. Phys., Evert. p. 83.
1906. *Zootecus insularis*, Ehrn., Pilsb., Manual, xviii. pp. x (1907) 106; pl. xxvi. figs. 21-32; li. (1907) fig. 10.

*Hab.* Lasdur, 10 km. N. of Huguf Spring, 650 metres (*Macfadyen*).

Widely distributed from India to North-east Africa; the Lasdur examples are typical.

## Family **Pomatiidæ.**

### Genue GEORGIA, Bgt., 1882.

### *Georgia naticopsis*, Bgt.

1882. *Georgia naticopsis*, Bgt., Miss. Revoil, p. 71, pl. iii. figs. 43–48.
1928. *Otopoma* (*Georgia*) *naticopsis*, Bgt., Conn., Atti Soc. Nat. Modena, lix. p. 131.

*Hab.* Valley of the Darrar; Fararele, Dolbahontes District (*Revoil*); Hill 5 km. N. of Upper Halin Camp, 9° 05′ N., 48° 35′ E. (*Macfadyen*); Marojeh, Al Hills, 4000 feet (*Barrington Brown*); Chor Aded (*Stefanini*).

Also known from Italian Somaliland.

A large species, with stronger spiral grooving than that which follows and particularly well marked sculpture on the operculum.

### *Georgia perrieri* (Bgt.).

1881. *Otopoma perrieri*, Bgt., Moll. Çomalis, p. 4.
1881. *Otopoma poirieri*, Bgt., Moll. Çomalis, p. 6.
1882. *Georgia perrieri*, Bgt., Miss. Revoil, p. 73, pl. iii. figs. 50, 51.
1882. *Georgia poirieri*, Bgt., Miss. Revoil, p. 74, pl. iii. figs. 54-56.
1882. *Georgia revoili*, Bgt., Miss. Revoil, p. 76, pl. iii. figs. 52, 53.
1889. *Otopoma* (*Georgia*) *poirieri*, Bgt., Smith, Journ. of Malac. vii. p. 57.
1928. *Otopoma* (*Georgia*) *perrieri* (=*poirieri*), Bgt., Conn., Atti Soc. Nat. Modena, lix. p. 134.
1928. *Otopoma* (*Georgia*) *perrieri*, var. *revoili*, Bgt., Conn., ibid. p. 136.

*Hab.* Valley of the Darrar, Dolbahontes District (*poirieri*) and Fararélé (*revoili*, Revoil); Ogardain (*Phillips & James*); Morobyeh; Lugat (*Donaldson Smith*); Gal Gudan Hill; Hergawt Hill; Lasdur; Durfahrli Hill; Bihen Gaba; El Gumbe'el; Surad Mountain; East end of Siradleh, 1700 metres; Erigavo District (*Macfadyen*).

*Perrieri* and *poirieri* were originally described from Italian Somaliland.

Smith wrote that he could see no real difference between the four so-called species of *Georgia* cited above, but after examining a very large number of individuals from many localities it appears to me that *naticopsis* is distinct. On the other hand, *perrieri*, *poirieri*, and *revoili* were differentiated on insignificant details of form and size, and, as shown by me in 1928, every intermediate exists from examples larger than the largest measured by Bourguignat down to others far smaller than his *G. revoili*, in proof of which I may state that his types were as follows:—

*perrieri*, diam. 26, alt. 20 mm.
*poirieri*, diam. 23, alt. 20 mm.
*revoili*, diam. 19, alt. 16 mm.
*naticopsis*, diam. 30, alt. 28 mm.

The largest example I have seen of *naticopsis* from Upper Halin measures 33 × 31 mm., while measurements of some of the *perrieri* group are as under:—

Bihen Gaba, 28·3 × 25; Erigavo District, 29·5 × 27·2 and 25·8 × 26·7; Mandera, 16·8 × 13; Jidale, 23 5 × 23·1; the smallest I have seen from Italian territory was only 13 × 11 mm.

Although a certain amount of spiral striation is usually plainly visible, this species is smaller and much smoother than *naticopsis*; the coloration in fresh specimens is very bright and varied, there being several narrow red or darker bands on a ground of flesh, cream, or fawn.

## III. Aquatic Mollusca.

### Family Tiaridæ.

### Genus Melanoides, Oliv., 1807.

### *Melanoides tuberculata* (Müll.).

1774. *Nerita tuberculata*, Mull., Verm. Hist. ii. p. 191.

*Hab.* Mandera (*Feather*); Dubar, 8 miles S.E. of Berbera; Huguf Spring; El Gumbe'el, near Jidale (*Macfadyen*); Bunda Ziada on the British-Italian frontier (*Barrington Brown*).

The title of this paper makes no reference to aquatic molluscs, since the only species yet authenticated from the territory is the ubiquitous form named above; nearly all are particularly smooth, and can be referred to *M. maraensis*, Preston, if that is worthy of even varietal rank.

It will be seen from the brevity of the foregoing list, only thirty-four species in all, and the fact that the province has been worked by so few collectors, all of whom were occupied for most of their time on far more weighty matters than conchology, that a richer molluscan fauna probably awaits discovery when really serious attention can be devoted to the subject. In the meantime, hearty congratulations are due to Messrs. Macfadyen and Barrington Brown for adding much to our knowledge of ten of the species already recorded and increasing by eight more the total of this fauna.

Omitting varietal names and proven synonyms, the distribution of the remaining thirty-four is as follows:—

(*a*) British and Italian Somaliland (5): *Ledoulxia formosa*, *Petræus revoili*, *Rachis revoili*, *Georgia naticopsis*, and *perrieri* (Bgt.).

(*b*) British Somaliland and Abyssinia (5): *Vitrina giuliettii*, Pollon., *Cerastus abyssinicus* (Pfr.), *Limicolaria donaldsoni*, Pilsb., *Homorus perlucidus*, Prest., and *Opeas münzingeri* (Jick.).

(*c*) North-east Africa and Asia (3): *Petræus candidus* (Lam.), *Pupoides cerealis* (Paladh.), and *Zootecus insularis* (Ehrn.).

(*d*) Peculiar to British Somaliland (21, of which, however, I regard eight as of very doubtful status): *Streptostele suradensis*, Conn., *Gulella somaliensis* (Smith) and *orestias* (Tmln.), *Zonites somaliensis*, Conn., *Cerastus achatinoides* and *putealis*, Conn., *boothi* and *featheri* (Tmln.) and *somaliensis* (Smith), *Petræus macropleurus*, *bertrandi* *, *pauli* and *delagenieri* * (Bgt.), *Rachis perrieriana* *, *rochebruni*, *armandi* *, *maunoiriana*, *milne-edwardsiana* *, *leontinæ* *, and *rabaudi* *, Bgt., and *libbahensis* * (Tomlin).

## EXPLANATION OF THE PLATES.

### Plate X.

*Fig.* 1. *Orcula tomlini*, Conn., × 7.
*Figs.* 2–4. *Trachycystis approximans*, Conn., × 3.
*Fig.* 5. *Fauxulus barnardi*, Conn., × 6½.
*Figs.* 6–8. *Trigonephrus lucanus* (Müll.), var. *nana*, Conn., × 1.
*Fig.* 9. *Gulella carpenteri*, Conn., × 5.
*Fig.* 10. *Gulella devia*, Conn., × 8.
*Fig.* 11. *Fauxulus fryanus* (Bs.), × 4.

### Plate XI.

*Figs.* 1–3. *Vitrina variopunctata*, Conn., × 3.
*Fig.* 4. *Gulella excruciata*, Conn., × 1.
*Fig.* 5. *Nothapalus innotabilis*, Conn., × 1.
*Fig.* 6. *Homorus velutinus*, Conn., × 1⅓.
*Fig.* 7. *Homorus velutinus*, Conn., embryo, × 6.
*Fig.* 8. *Cerastus achatinoides*, Conn., × 1.
*Figs.* 9–11. *Zonites somaliensis*, Conn., × 1.
*Fig.* 12. *Streptostele suradensis*, Conn., × 3.

### Plate XII.

*Figs.* 1–3. *Homorus ellioti* (Smith), Toro District.
*Fig.* 4. *Homorus malleatus*, Conn.
*Fig.* 5. *Bocageia carpenteri*, Conn.
*Figs.* 6–9. *Unio introrugatus*, Conn.
*Fig.* 10. *Euæthiops obtusa*, Conn., type.
*Fig.* 11. *Euæthiops obtusa*, Conn., obese example, apex broken.
*Fig.* 12. *Euæthiops obtusa*, Conn., another example.

All figures natural size.

### Plate XIII.

*Figs.* 1–8. *Rachis maunoiriana* (Bgt.), Mandera.
*Figs.* 9–11, 18, 19. *Rachis maunoiriana* (Bgt.), Gal Gudan Hill.
*Figs.* 12–17, 20–23. *Rachis maunoiriana* (Bgt.), Surad Mountain.

All above natural size.

*Figs.* 24–27. *Pisidium costulosum*, Conn., × 9¼.

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* Doubtful species.

## XLIII.—*Notes on the Genus* Xyleborus, *Eichh.*

By KARL E. SCHEDL.

### I. A FEW NEW SPECIES.

### *Xyleborus justus*, sp. n.

*Description of the Adult Female.*—Shining, very dark reddish brown, 1·46 mm. long, 2·25 times as long as wide, glabrous except the anterior part of the pronotum and the declivity, which bear scattered hairs. Allied to *X. minutus*, Blandf.

*Front* polished, with a well-developed median carina extending from the epistomal margin up to a level of the upper margin of the eyes, laterally of the carina strongly impressed, the vertex convex and minutely granulo-reticulate; lateral impressions with scattered setose punctures; eyes finely granulate, short-oval, shallowly emarginate in front; antennæ yellowish, scape distinctly longer than the funiculus and club united, the latter short-oval, little longer than wide, truncate portion squamose and without visible sutures.

*Pronotum* 1·06 times wider than long, widest at the posterior third; base very feebly bisinuate, postero-lateral angles rectangular, only slightly rounded, sides and anterior margin uniformly rounded in more than a semicircle, side-margins acute and margined on the basal three-fourths; globose, summit before the middle, anterior area steeply declivous, rather coarsely asperate, but with little indications of concentric arrangement, anterior margin armed with four asperities, the median two being somewhat larger and recurved, the asperate portion with scattered, short, yellow hairs; posterior part with minute reticulation and scattered fine punctures. Scutellum well developed, triangular, smooth, shining.

*Elytra* as wide and 1·43 times as long as the pronotum; antero-lateral angles rectangular, slightly rounded, sides subparallel through the basal two-thirds, subacuminate behind; disc lineate-punctate, punctures rather fine and remotely placed, first striæ impressed throughout, others not at all, first interstice very narrow with a few hardly noticeable punctures, remaining interstices subrugulose with remote and somewhat irregularly placed and fine punctures, glabrous; *declivity* commencing at the middle of the elytra, shining, sloping, plano-convex, depressed along the suture; the lateral margin up to the seventh interstice and the apical margin acute and margined; punctuation little stronger but not denser and little more irregular than on the disc. Anterior tibiæ strongly widened distally with the apical mucro and six lateral spines.

Holotype: ♀, Java, Buitenzorg, 250 m., from *Cassia* (*Fr. A. Th. H. Verbeek Coll.*).

Paratypes (one ♀), same label.

The two specimens are very much alike and have more the appearance of males. A balsam mount of the apical sternites of the paratype proves them to be females.

From *minutus*, Blandf., this species is mainly distinguished by the proportion of the pronotum, the acuminate apex of the elytra, the commencement of the declivity, and the lack of tubercles on the latter.

Although the mouth-parts, proventriculus, and genitalia have been studied, they will be discussed at a later date when more material has been examined on that account, to make conclusions possible as to what may be regarded as generic and what as specific characters. This applies also to the following species.

### *Xyleborus semigranulatus*, sp. n.

*Description of the Adult Female.*—Dark reddish brown, decidedly darker on the declivity; pronotum and anterior third of the elytra subshining, declivity opaque; 2·41 mm. long, 2·70 times as long as wide. Allied to *hybridus*, Egg., *sereinuus*, Egg., *semiopacus*, Eichh., and *semirudis*, Samps.

*Front* plano-convex, very finely reticulate below, towards vertex somewhat coarser and more granulate; median longitudinal carina distinct but feebly developed, laterad of the carina and up to a level of the upper margin of the eyes coarsely but sparsely punctured; pubescence obsolescent except for a fringe of longer hairs on the epistomal margin; eyes rather small, coarsely granulate, anterior emargination moderately deep; antennæ yellowish, scape shorter than funiculus and club united, the latter short-oval (33 : 31), truncate portion covered with short hairs and without visible sutures.

*Prothorax* slightly wider than long, subquadrate in general appearance, base bisinuate, postero-lateral angles strongly rounded, sides arcuate, antero-lateral angles distinct, then somewhat constricted and rather narrowly rounded in front; not globose, moderately convex when viewed from the side, summit behind the middle, strongly declivous before, nearly horizontal behind it; anterior margin not armed, before the summit rather finely asperate, posterior area smooth, minutely reticulate, subshining, very sparsely and very finely punctured; the whole pronotum subglabrous. Scutellum small, cordate, smooth, the centre impressed.

*Elytra* 1·90 times as long as the pronotum, sides straight, slightly divergent posteriorly, in the last third angulately rounded; declivity commencing after the basal third, uniformly rounded and distinctly depressed before the apex; disc striate-punctate, punctures coarse, not very densely placed, interspaces slightly convex, rugulose, subshining, indistinctly and very finely uniseriate punctate; declivity opaque, strial punctures becoming smaller but more impressed, interstices carinate and very closely uniseriate tuberculate, tubercles dull and decreasing in size towards the apex, on the first interstice disappearing altogether, apical margin and sides acute up to the seventh interspace.

Holotype (♀) bears the label "Java, Mount Gede, 1500 m., 25. viii. 1923, C. 869 (*L. G. E. Kalshoven*)."

Paratypes (3 ♀), same label.

The paratypes agree entirely with the holotype. The male is not represented in the series. From the closely allied *X. hybridus*, Egg., this species may be distinguished by the narrowly rounded anterior margin of the pronotum, the position of the summit, the proportions of the elytra, the tuberculation of the declivity, etc.

### *Xyleborus vestitus*, sp. n.

*Description of the Adult Female.*—Dark reddish brown, strongly shining, 2·39 mm. long, 3·76 times as long as wide. Allied to *X. detritus*, Egg.

*Front* plano-convex, minutely reticulate, rather coarsely but sparsely above, finer and more granulate punctate below, with a slight transverse impression at the level of the upper margin of the eyes, sparsely covered with long yellow hairs; eyes rather coarsely granulate, emarginate in front, emargination as wide as deep; antennæ concolorous, scape distinctly longer than the club and funiculus united, rather stout, club wider than long (34 : 40), truncate face without visible sutures but densely covered with short pubescence.

*Pronotum* 1·58 times as long as wide, base slightly arcuate, postero-lateral angles rectangular, rounded, sides parallel on the basal three-fourths, declivous in front; anterior margin not armed with asperities, anterior third with fine asperities and sparse but long yellowish hairs, basal two-thirds finely but deeply and moderately densely punctured, except on a narrow median strip, which is smooth, glabrous, except for a few long hairs at the sides; side-margins acute on more than the basal half. Scutellum cordate, small, shining.

*Elytra* as wide and 1·26 times as long as the pronotum, 2·1 times as long as wide, antero-lateral angles rectangular, only slightly rounded, sides parallel on the basal four-fifths, then abruptly rounded, and with a shallow emargination in the middle; cylindrical, disc striate-punctate, striæ not impressed, but punctures deep and moderately densely placed, interstices flat, impunctate except for a few punctures which are scattered here and there; declivity commencing at the basal third, at first more gradually, then more steeply excavate, lateral margins high, with three teeth on each side, the first at a point where the third interstice reaches the declivital margin, directed inwards and backwards, second much larger than first, and third at the fourth interstice about in the middle of the lateral margin of the declivity; the third and smallest is distinctly inside the lateral margin and as far distant from the second as the first from the second; all teeth bear a long yellow hair, behind the second tooth the lateral margin of the declivity is crenulate; excavation strongly shining, smooth except for an interrupted stria which occurs on the inner base of the teeth; suture elevated, first stria distinct at the beginning of the declivity but becoming obscure towards the apex.

Holotype (♀), Java, Buitenzorg, 250 m., 5. ix. 1924 (*L. G. E. Kalshoven*).

Paratypes (3 ♀), same label.

This species is of similar shape to *X. pumilus*, Egg., but differs greatly in the declivital armature. From *X. detritus*, Egg., it may be separated by the shining declivital excavation, the smaller size, the impunctate discal interspaces of the elytra, etc.

### *Xyleborus vespatorius*, sp. n.

*Description of the Adult Beetle.*—Uniformly reddish brown, 2·76 mm. long, 3·40 times as long as wide. Allied to *X. sentosus*, Eichh.

*Front* of the head plano-convex, finely granulo-reticulate, below rather densely rugose, median carina indicated by a very low elevation which is distinctly above the epistomal margin, but the sculpture is the same as on the rest of the front; scattered long hairs, especially below; eyes rather coarsely granulate, shallowly emarginate in front; antennæ concolorous, scape stout, as long as the funiculus and the club united, club subcircular, truncate portion squamose with no visible sutures. Scutellum small and shining.

*Pronotum* 1·26 times as long as wide, base rather strongly arcuate, postero-lateral angles obtusely rounded, sides straight, slightly divergent towards the apex, without constriction, broadly rounded in front, sides acute near the base only; not gibbose, summit before the middle, a very shallow depression behind it: anterior area declivous, rather finely and irregularly asperate, anterior margin unarmed, posterior area minutely reticulate, distinctly but not densely punctured, median line slightly elevated but not noticeably less punctured. Scutellum small, triangular, smooth, and shining.

*Elytra* slightly wider and 1·58 times as long as the pronotum, 2·00 times as long as wide, sides slightly arcuate, widest at the middle, truncate at apex, with a shallow emargination near the suture; anterior half cylindrical, posterior half sulcate; disc shining, lineate-sulcate, sutural striæ slightly, others not at all, impressed except posteriorly at both sides of the declivity, where they are slightly so, strial punctures moderately fine and rather closely placed, first interspace narrow and with a few small punctures, other interstices wide, flat, subrugulose, with uniseriate, remote, somewhat irregularly placed punctures which become coarser and more densely placed near the declivity; from all interstrial punctures originate erect hairs (abraded on the anterior half); declivity commencing behind the middle, sulcate, lateral margins moderately high, elevated; declivital armature consists of a small granule on the second interspace at the commencement of the sulcus, a small erect tooth on the third interspace and a distinctly larger one on the fourth interspace, the latter of which is about in the middle of the lateral margin; two tooth-like granules occur on each side near the apex, laterad to the posterior part of the declivity a few small granules are also present; first striæ strongly impressed, suture elevated, smooth, and widened posteriorly; remaining concavity narrow, rugulose, sparsely irregularly punctured; the whole concavity strongly shining. Anterior tibiæ moderately widened distally, with apical mucro and six teeth on the lateral margin.

Holotype (♀), Argentina, San Ignacio, 1929 (*L. Bade*).

*X. sentosus*, Eichh., which is similar in shape, has the declivity subtruncate and the impressed area subcircular. The declivital armature is also much more strongly developed.

### *Xyleborus xylocranellus*, sp. n.

*Descripton of the Adult Beetle.*—Yellowish brown, apex of the elytra gradually becoming somewhat darker and more reddish brown; 2·60 mm. long, 3·10 times as long as wide, pubescence short but dense all over the surface. Probably allied to *X. penicillatus*, Hag.

Front plano-convex, densely, moderately coarsely punctured, median carina indicated by a short smooth space just above the epistomal margin; eyes large, coarsely granulate, and deeply emarginate in front; antennæ concolorous, scape stout, little longer than the club, club as wide as long, subcircular, compressed, with indications of one suture on the externo-lateral face.

*Pronotum* 1·20 times as long as wide, base slightly arcuate, postero-lateral angles rectangular, only slightly rounded, sides parallel on the basal two-thirds, anteriorly broadly rounded; summit far before the middle, not gibbose, anterior margin unarmed, anterior area very finely asperate, asperities extremely low, with only little indications of concentric arrangement, behind the summit shining, closely moderately finely punctured, more densely placed towards the sides, side-margins acute and sharp on their entire length, median line not smooth nor elevated; fine and short pubescence all over the pronotum but more densely at the sides. Scutellum small, smooth, shining.

*Elytra* as wide and 1·75 times as long as the pronotum, sides parallel on the basal four-fifths, then each elytron separately rounded, forming an angulate shallow emargination at the suture; basal two-thirds cylindrical, shining, lineate-punctate, striæ not at all impressed, punctures very closely placed, first interstice narrow at the base but twice as wide near the declivity, uniseriately somewhat irregularly punctured, especially confused near the declivity, remaining interstices irregularly biseriately punctate, confused near the declivity; all punctures bear short, yellow, recumbent hairs; declivity commences at the beginning of the apical third of the elytra, obliquely truncate, deeply concave, declivital margin acute all round and armed with well-developed granules; at the middle of the lateral declivital margin occurs a tooth-like larger tubercle, a distinct but lower tooth at the apical fourth, the latter somewhat inside the lateral margin, a third but smaller tooth-like tubercle appears near the apex; declivital concavity densely, coarsely, and irregularly punctured, the suture slightly elevated, and with a row of small granules which decrease in size and number towards the apex.

Holotype collected in Brazil.

The antennæ, which are compressed, and the extremely acute side-margin of the pronotum are characters unusual in the genus *Xyleborus*. The shape of the declivity and the dense pubescence are similar to *X. penicillatus*, Hag., from which species it differs in size, the armature of the declivity, and the less long and dense pubescence on the declivital concavity.

It might prove that this species should be referred to a new genus, but at the present time it is left in *Xyleborus* until more material is available.

### *Xyleborus argentinensis*, sp. n.

*Description of the Adult Female.*—Reddish brown, 2·81 mm. long, 3·00 times as long as wide. An intermediate form between the *monographus* and *confusus* group.

*Front* plano-convex, finely subrugulosely reticulate, coarsely but not densely punctured, with scattered rather short hairs; median carina scarcely indicated; eyes coarsely granulate, moderately deeply emarginated in front; antennæ somewhat lighter in colour, shape, and proportion similar to *justus*, sp. n., but larger.

*Pronotum* 1·10 times as long as wide, base transverse, postero-lateral angles rectangular, strongly rounded, sides parallel on the basal two-thirds, broadly rounded in front; summit at the middle, anterior margin smooth but slightly extended anteriorly; anterior area rather finely and closely asperate, posterior area shining, finely and moderately densely punctured, median line impunctate but narrow, lateral margin acute on the basal half; rather long and sparsely pubescent anteriorly and laterally. Scutellum moderately large, cordate, smooth.

*Elytra* as wide and 1·66 times as long as the pronotum, antero-lateral angles rectangular, slightly rounded, sides subparallel on the basal three-fourths, rather narrowly and slightly angulately rounded behind; cylindrical on the anterior three-fourths, steeply declivous behind; disc lineate-punctate, sutural striæ distinctly, others hardly noticeably impressed, punctures moderately fine, as far apart as their diameter, interstices plano-convex, first interstice about twice as wide near the declivity as near the base, with a few scattered punctures and two to three small granules before the declivity, remaining interstices uniseriately, remotely, and finely punctured, and also with a few granules before the declivity; declivity subshining, as in *X. affinis*, Eichh., flattened but rather steep, first striæ strongly impressed, all strial punctures as large as on the disc but shallow and more like shining discs, as in *affinis*; first interspace slightly elevated with two to three minute and setose granules, second interspace impunctate but with two granules near the summit, third interspace with one at the summit and a larger one at the middle of the declivity, remaining interstices impunctate. Anterior tibiæ with the apical mucro and six lateral teeth.

Holotype (♀), Argentina, San Ignacio, 1929, 1 (*Bade*).

Paratypes (7 ♀ ♀), same label.

By the armature of declivity easily separated from its allies.

## II. New Records of *Xyleborinæ*.

*Xyleborus affinis*, Eichh.—Argentina, San Ignacio, 1929, 1930; *L. Bade*, ex *Tecoma Ipe*, Mart. (Lapache Negro).

—— *alternans*, Eichh.—Costarica, Reventazon.

—— *badius*, Eichh.—Deutsch Ost-Afrika, Usaramo and Ugogo.

—— *coffeæ*, Wurth.—Java, Res. West Prianger, 27. ii 1929, on tea, Fr. A. Th. H. Verbeek Coll.; Java, Res. Oost Prianger, 5. ii. 1929, on tea, same collector.

—— *cognatus*, Blandf.—Java, September, 1919, L. G. E. Kalshoven Coll.

—— *confusus*, Eichh., Argentina, San Ignacio, 1929, 1930 (*L. Bade*); Deutsch Ost-Afrika, Pugu; Costarica, Reventazon.

—— *bispinatus*, Eichh.—Argentina, San Ignacio, 1929 (*L. Bade*).

—— *dilatatus*, Eichh.—Australia, Sydney.

—— *fornicatior*, Egg.—Java, Res. Pasoeroean, 14. ii. 1929, in *Tephrosia mozuma*, Fr. A. Th. H. Verbeek Coll.

—— *kraatzi*, Eichh.—Java, Res. Getasan Banjoement, 9. iii. 1929, Fr. A. Th. H. Verbeek; Java, 20. xii. 1919 (*L. G. E. Kalshoven*); Deutsch Ost-Afrika, Usaramo and Ugogo; Costarica, San José.

—— *minor*, Sw. (nec Samps.).—Canada, Ottawa, Ont., 1929, reared from *Picea mariana*, K. E. Schedl.

*Xyleborus morigerus*, Blandf.—The specimens agree entirely with Blanford's description, except that the elytra are only 1·26 times as long as the pronotum, and not one-and-a-half times, as was recorded by Blanford; Java, Res. Pasoeroean, 14. ii. 1929, from *Tephrosia mozuma*, Fr. A. Th. H. Verbeek; Java, Buitenzorg, December 1929, from *Cassia multijuga*, Culturtrin, same collector; another series, same label, but taken on 16. ii. 1929.

—— *perforans*, Woll.—Guadeloupe.

—— *semigranosus*, Blandf.—Java, Res. Banjoement, 9. iii. 1929, Fr. A. Th. H. Verbeek.

—— *similis*, Ferr. (*submarginatus*, Blandf.).—Java, Buitenzorg, 250 m. (*L. G. E. Kalshoven*).

—— *torquatus*, Eichh.—Argentina, San Ignacio, 1929 (*L. Bade*).

## XLIV.—*Records of* Tachinidæ (Larvævoridæ), *with new African Species* (*Dipt.*). By B. Rohdendorf.

The following records are based on a collection of Sarcophaginæ and Tachininæ (Larvævorinæ) submitted for identification by the Imperial Institute of Entomology.

### *Tricholyga africana*, sp. n.

♂.—Eyes very pilose. Frons equal to ¼ of the head. Face silvery white, frons yellowish. Antennæ black, third joint three times as long as second; second joint of arista three times as long as broad. Frontals long, crossed; lower pairs situated below the middle third of the last antennal joint. Vibrissals not ascending; above vibrissæ 3–4 short hairs. Peristoma (cheeks) broad, equal to ⅓ of the eye-height, with short black pilosity. Hind surface of head white pilose.

Thorax black, scutellum red-yellow, on the base black; dorsum grey pollinose, with five longitudinal stripes. Dorsocentrals 3+4, acrostichals 4+2. Scutellum with short and strong crossed apicals, subapicals 2·5 times as long as apicals, long. Sternopleurals 2+1. Mesopleuræ with dense short black hairs. Wings hyaline. Cell $R_5$ narrowly open. Anterior and posterior cross-veins parallel. Base of vein 4+5 bristly to halfway to *rm*. Costal spine short, distinct. Claws very long.

Abdomen obscure, with red-yellow spots on sides of third and fourth tergites. The anterior margin of tergites with transverse bands of whitish dust, the hind margins shining black. The second, third, and fourth tergites with central marginals, the fifth with several discals and marginals. Fifth ventrite and posterior half of fourth with a patch composed of very dense short bristles (similar to those of *Sturmia*). The genitalia black, hairy.

Length of body 12 mm.

ANGLO-EGYPTIAN SUDAN: Wad Medani, 1 ♂, 1. iii. 1926, on *Lubia* (*H. W. Bedford*).

### *Larvævora* (*Ptilotachina*) *fallax æthiopica*, subsp. n.

♂.—Differs from *fallax fallax*, Meig., as follows:—Posterior surface of head with very dense white hairs; thorax densely pollinose, last abdominal tergite with a very narrow reddish brown posterior margin.

ANGLO-EGYPTIAN SUDAN: Wad Medani, 1 ♂, 30. v. 1923, in house (*H. B. Johnston*).

### *Sarcophaga destructor*, Mall.

ANGLO-EGYPTIAN SUDAN: Zeidab, 2 ♀ ♀, 10, 12. iv. 1922 (*W. E. Giffard*); Wad Medani, 1 ♂, 2 ♀ ♀, v. 1929, bred from growing tomatoes (*H. B. Johnston*).

### *Sarcophaga exuberans*, Pand.

ANGLO-EGYPTIAN SUDAN: Zeidab, 1 ♂, 28. iii. 1919 (*H. W. Bedford*); 6 ♂ ♂, Khartoum, 11. ii. 1917 (*B. Cottam*), 17. ix. 1921, bred from human excreta (*H. W. Bedford*), 12. viii. 1925 (*H. B. Johnston*); near Resaf, 1 ♂, 6. iv. 1918 (*H. W. Bedford*).

### *Sarcophaga hirtipes*, Wied.

ANGLO-EGYPTIAN SUDAN: Karara, 1 ♀, iv. 1926 (*C. E. Fouracres*); Port Sudan, 2 ♀ ♀, 22. xii. 1923 (*H. B. Johnston*); near Resaf, 2 ♀ ♀, 6 iv. 1918 (*H. W. Bedford*).

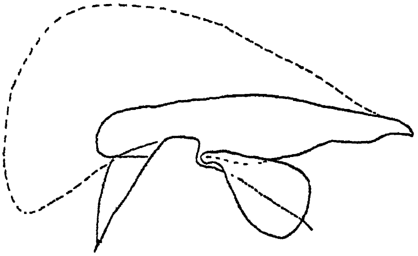
### *Sarcophaga hæmorrhoidalis*, Meig.

ANGLO-EGYPTIAN SUDAN: Karara, 1 ♂, iv. 1926 (*C. E. Fouracres*).

*Sarcophaga globicauda*, sp. n. (Figs. 1 & 2.)

♂.—Frons narrow, equal to 0·16 of head. Lateral verticals weak; frontals strong, crossed; facials weak. Peristoma with whitish hairs. Ocellars weak, hair-like.

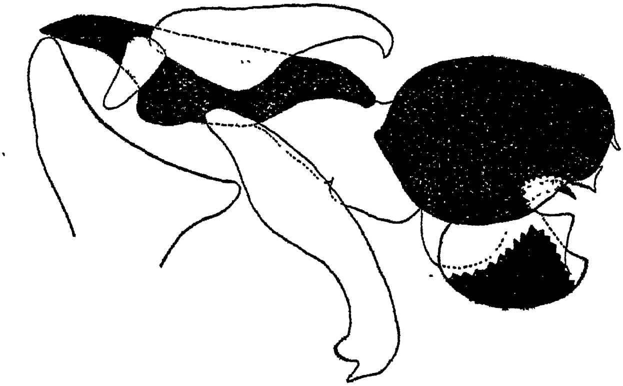
Fig. 1.



*Sarcophaga globicauda*, sp. n. Superior and inferior forceps.

Vibrissal ridge pilose halfway to base of antennæ. Third joint of antennæ twice as long as second. Palpi reddish. Frons and face pale yellow pollinose. Antennæ black. Peristoma whitish.

Fig. 2.



*Sarcophaga globicauda*, sp. n. Penis, theca, interior forceps, and palpus genitalium.

Thorax black, yellowish grey pollinose, with three bright black longitudinal stripes. Posterior dorso-centrals four, the two anterior weak. Acrostichals 0+1, moderately long. Scutellum with strong subapicals and basals, and with weak apicals and dorsals. Laterals wanting; sternopleurals $1+1+1$. Mid-femora fringed, with ctenidium. Hind femora and tibiæ villous; femora with lower macrochætal row. Legs dark, tibiæ brownish. Wings hyaline. Costal bristle wanting. Vein $r_1$ bare, vein $r_{4+5}$ bristly at halfway to *rm* cross-vein. Posterior cross-vein feebly curved.

Abdomen black, tessellate pollinose; hind margin of fifth tergite red. Third tergite without median marginal bristles; seventh black, grey pollinose, without marginal bristles; eighth orange. Superior forceps straight, very slightly curved apically; inferior forceps rounded. Penis globular, without spine-like apophyses. Interior forceps acute, curved. Palpus genitalium long, with two tooth-like processes præapically (similar to those of *Blæsoxipha*). Theca long, straight dorsally. (See figs. 1 & 2.)

Length of body 11 mm.

ANGLO-EGYPTIAN SUDAN: Mongalla, 1 ♂, 12. i. 1920 (*J. R. Fardley*).

*Sarcophaga furcadorsalis*, sp. n. (Figs. 3–5.)

♂.—Frons very narrow, equal to 0·11 of head (deformed?). Lateral verticals absent; frontals strong, crossed; facials moderately strong. Third joint of antennæ narrow, equal to 2·5 times the second. Peristoma with black hair-like bristles. Ocellars short and weak. Vibrissal ridge bare. Frons, face, and peristoma silvery-reddish pollinose. Antennæ and palpi black; palpi filiform.

Thorax black, grey-dusted; dorsum with three broad black longitudinal stripes. Wings hyaline, slightly infumate, squamæ yellowish. Postsutural dorso-centrals four, the two anterior weak. Acrostichals $0+1$, very weak. Scutellum with strong basals and subapicals and weak dorsals; dorsal bristles very close to hind margin of scutellum. Apicals, laterals, and præbasals absent; sternopleurals $1+1+1$. Legs dark. Mid-femora without ctenidium, with a row of weak short bristles. Hind femora with lower anterior macrochætal row. Mid- and hind femora slightly villous. Mid-tibiæ bare, hind tibiæ very slightly fringed præapically. Vein $r_1$ bristly at halfway to costa, vein$_{4+5}$ bristly $\frac{3}{8}$ of way to *rm* cross-vein. Posterior cross-vein curved.

Abdomen black, brownish-grey pollinose. Third tergite without central marginals. Seventh tergite brown, with marginal row of weak long bristles. Eighth tergite red-yellow. Forceps superior black, forceps inferior red. Forceps superior strong curved ventrally, hook-like, slightly incised præapically. Forceps inferior large, with bristles. Forceps interior curved apically. Palpus genitalium short and broad, with three teeth. Theca short, concave dorsally. Penis (see figs. 4 & 5).

Fig. 3.

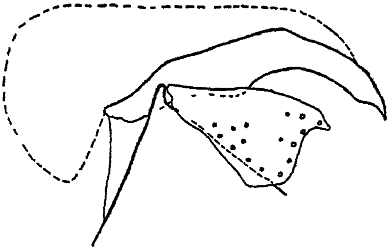
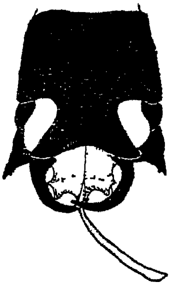


Fig. 4.



*Sarcophaga furcadorsalis*, sp. n.

Fig. 3.—Superior and inferior forceps.
Fig. 4.—Penis (dorsal view).

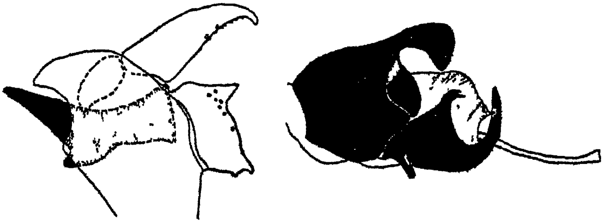
♀.—Very similar to ♂. Frons broader, equal to 0·21–0·22 of head. Abdomen very brownish.

Length of body (♂ ♀) 6–8 mm.

Sierra Leone: 1 ♂, 3 ♀ ♀, viii.–ix. 1930 (*E. Hargreaves*).

Bred from imago of *Locusta migratoria migratorioides*, R. & F.

Fig. 5.



*Sarcophaga furcadorsalis*, sp. n. Penis, theca, interior forceps, and palpus genitalium.

*Blæsoxipha* (s. str.) *filipjevi æquatorialis*, Rohd.

Sierra Leone: 2 ♂ ♂, 2 ♀ ♀, 27. vii., 1. viii. 1930.

Bred from imago of *Locusta migratoria migratorioides* (*E. Hargreaves*).

# XLV.—*Two remarkable new Species of* Empididæ (*Diptera*) *from New Zealand.* By J. E. COLLIN, F.E.S.

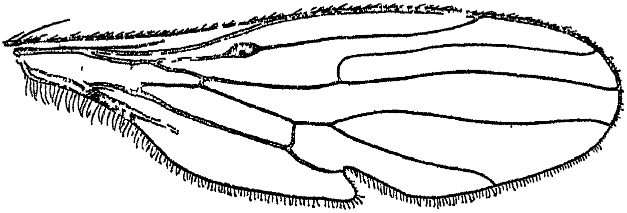
## Subfamily *CERATOMERINÆ.*

### *Ceratomerus longifurcatus*, sp. n., ♂.

Allied to *C. prodigiosus*, Coll., but differing in colour and wing-venation.

♂. Head dull bluish grey. Frons very wide at vertex, narrowing towards front; face rather narrower than front of frons, more silvery grey. Ocellar bristles strong, very wide apart, immediately in front of, but even wider apart than, hind ocelli; a bristle on each side of front of frons; two to three pairs of vertical bristles curving forwards, other occipital bristles short and scattered. Palpi yellow, very large and long, with similar tufts of bristles to those of *prodigiosus*; labium also with numerous outstanding short bristles. Antennæ very long, almost as long as in *prodigiosus*, and without distinct style.

Fig. 1.



*Ceratomerus longifurcatus*, ♂.

Thorax dull bluish grey. Acrostichals very small, biserial, ending before prescutellar depression; dorsocentrals about four pairs, with a small bristly hair between first and second and second and third bristles; an upcurved humeral, a post-humeral, 2 notopleural, 2 supra-alar with 3–4 small hairs in between, a postalar, and 2 scutellar bristles; prothoracic collar with a pair of widely separated bristles.

Abdomen brownish grey, pubescence dark, scattered, and not very long or strong even on hind-margins of segments. Hypopygium small, much smaller than in *virgatus*.

Legs with stout yellow front coxæ and femora, tawny yellow other femora, and brownish tibiæ and tarsi. Front legs with distinctive chætotaxy not easily described from type owing to unset condition of specimen; the posteroventral row of short bristly hairs on front femora begins near base in an elongate patch of short hairs; front tibiæ rather stout, with a ciliation of short hairs above and longer ones beneath; basal joint of front tarsi with an undulating lower surface bearing a row of bristles, and rather hairy behind. Middle tibiæ slender, with 2–3 small bristles above and one very small anteroventral one towards base, one posteroventral apical spur longer than other small apical bristles. Hind tibiæ with only three anterodorsal short bristles and an apical one in front. Basal joint of middle and hind tarsi long and slender, middle one with only very tiny spines beneath, hind one with a basal spine beneath and one behind just before basal third.

Wings (fig. 1) slightly brownish, with venation as in figure. Halteres greyish.

Length 3 mm.

One male in British Museum from Queenstown, New Zealand, 4. i. 1923 (*C. C. Fenwick*).

## Subfamily *HEMERODROMINÆ.*

### *Chelipoda digressa*, sp. n., ♂ ♀.

A species with third antennal joint almost twice as long as head, and (in male) remarkable venation.

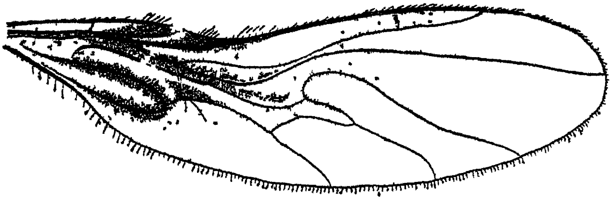
♂. Head dull dusted greyish. Face almost as wide as basal antennal joint. A pair of short ocellar bristles; occipital bristles also very short (even below), dark above, pale below. Antennæ with basal joint yellow; second dark brown, globular, equally as short as first; third black and pubescent, very long, tapering, and without apparent style. Palpi small and somewhat triangular, brownish grey on the broad base, but ending vertically below in a yellowish pointed tip; inner side with minute, blunt, black spines arranged transversely across base, and a brush of golden hairs across middle.

Thorax dusted greyish, ground-colour yellowish, with not very strongly differentiated darker stripes on pleuræ, and brown stripes on disc varying in position according to point of view; seen from in front there are three narrow stripes between dorsocentrals and a broader darker patch on each side, but from above or behind only the middle stripe and the side-patches remain visible. A pair of short dorsocentrals followed by a stronger pair on front part of thorax, a strong pair just behind a line connecting notopleurals, close behind these a much smaller pair, and further behind a microscopic prescutellar pair. An upcurved humeral, an upper notopleural, a supra-alar, and a pair of apical scutellar bristles all black. Metapleura with 5–6 black bristly hairs. Metanotum dark, dusted greyish.

Abdomen dusted greyish, like thorax, and with dirty yellowish ground-colour having darkened patches on middle line. Hypopygium yellowish grey of usual type for species from this region. Pubescence comparatively short, dark.

Legs yellow, with tarsi brownish towards tip; front coxæ almost as long as the very stout femora, with a dark streak down front and only very short hairs here and behind, but some longer bristly hairs at tip. Femora apparently with only three rows of spines beneath, those of middle row very short, basal 2–3 of front row and all 5 of hind row longer; tibiæ (about two-thirds length of femur) folding between front and middle rows. Second joint of front tarsi only very slightly shorter than third, the two together slightly longer than first. Basal joint of four other tarsi slender and long, as long as (middle), or longer than (hind), other four joints together.

Fig. 2.



*Chelipoda digressa*, ♂.

Wings (fig. 2) darkened about base and with remarkable venation, as figured. There is a bristle arising from postical vein close to base of discal cell, and in one wing of type an adventitious cross-vein across narrowest part of discal cell, shown by dotted lines in figure. Halteres yellow.

♀. Presumably correctly referred to this species, but differing from male in having a distinct antennal style about one-quarter length of long slender third joint; narrow, simple, ordinary palpi; no smaller pair of dorsocentrals close behind third pair; abdomen pointed, ending in a pair of small yellowish papillæ. Wings of ordinary *Chelipoda* venation, end of anal cell rectangular, anal vein faint about base, continued distinctly beyond end of anal cell for the short distance of about halfway to wing-margin.

Length nearly 2·75 mm.

A pair in the United States National Museum, Washington, taken by Mr. J. W. Campbell at Kumara, Westland, New Zealand, and dated xii. 2. 1930, which, I think, must mean February 12th, because I received them before December 1930.

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## XLVI.—*New Species of Fijian* Eumolpidæ (*Col., Phytophaga*).

By G. E. Bryant, Entomological Assistant, Imperial Institute of Entomology.

I now describe seven new species of Eumolpidæ from Fiji, which I propose to place in the genus *Demotina*, as they only differ from this genus in not having the femora armed with a small tooth. This genus has a wide range, from Japan to the Malay Archipelago, by far the greatest number being inhabitants of the latter area. No species has up to now been described from Fiji. The coloration and the scales make these species very difficult to describe, as the pattern is almost entirely due to the scaling, and this is easily rubbed. All this material has been collected by Messrs. R. Veitch, W. Greenwood, H. W. Simmonds, and Dr. H. Sylvester Evans, and the types have been presented to the British Museum.

### *Key to the Fijian Species of* Demotina.

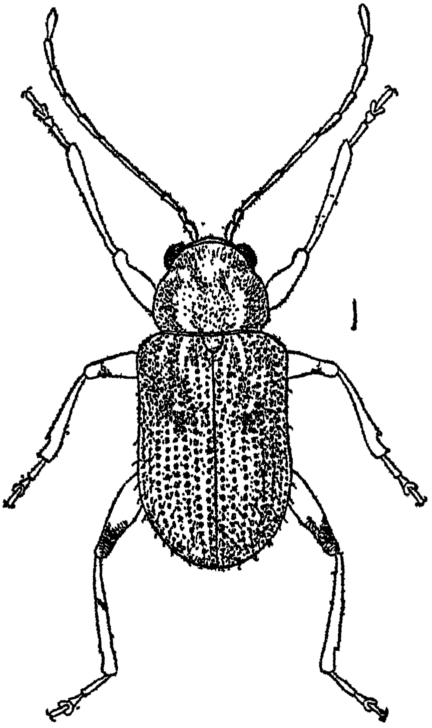
1 (14). Clothed with adpressed scales.
2 (7). Antennæ long, with the joints long.
3 (10). Distinct pattern formed by the scales.
4 (6). Apical half of the elytra with erect hairs.
5 (8). Colour plum-brown .................. *veitchi*, sp. n.
6 (4). Apical half of the elytra without erect hairs ........................... *dissimilis*, sp. n.
7 (2). Antennæ with the joints short .......... *vitiensis*, sp. n.
8 (5). Colour entirely fulvous.
9 (11). Colour not grey-black or black.
10 (3). Without pattern in the elytra .......... *fulva*, sp. n.
11 (9). Colour grey-black clothed with scales.
12 (13). Elytra with a ferruginous pattern ...... *evansi*, sp. n.
13 (12). Elytra with a pattern of white pubescent patches ........................... *obscurata*, sp. n.
14 (1). Not clothed with adpressed scales; colour black and shining, with white pubescent patches ........................ *albonotata*, sp. n.

*Demotina veitchi*, sp. n. (Figs. 1 & 2.)

Oblong, subcylindrical; plum-brown, with the legs and antennæ flavous, clothed with short white scales; prothorax finely punctured, the elytra strongly punctate-striate. L. 3·0–3·5 mm.

Head plum-brown, clothed with short scattered white scales, a strong longitudinal carina extending from between the eyes to the base; clypeus glabrous, rather strongly punctured; antennæ long and slender, flavous, the first two joints more swollen, the first about twice as long as the second, the rest long and slender, the fourth longer than the third or fifth, the seven terminal joints about equal to each other. Prothorax plum-brown, with the sides darker, finely punctured and clothed with short white scales, these

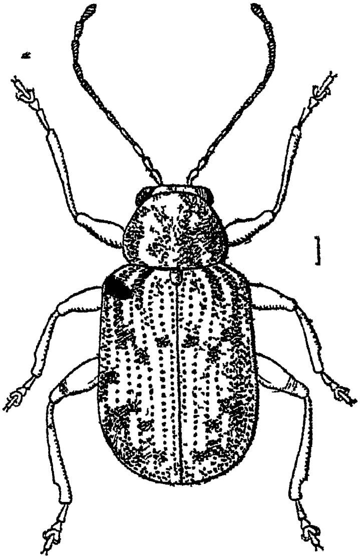
Fig. 1.



*Demotina veitchi*, sp. n., ♂.

being longer and more hair-like at the sides, forming two longitudinal wavy lines enclosing the median portion, which is lighter in colour, the sides rounded and contracted in front and the anterior margin depressed ; scutellum oblong-subpentagonal, clothed with short white scales. Elytra plum-brown, with darker lines and patches near the shoulders, oblong, rounded at the apex, strongly punctate-striate, clothed with short white scales, the apical half with long white erect hairs, forming longitudinal rows between the striæ ; legs flavous, clothed with white hairs, with the apical half of the posterior femora fuscous, and the apex of all the tibiæ tinged with fuscous ; underside fulvous and glabrous.

Fig. 2.



*Demotina veitchi*, sp. n., ♀.

♀. Of stouter build, with the antennæ shorter, and a very variable pattern formed by the scales on the elytra (fig. 2).

Fiji Is.: Labasa, xi. 1922 (*R. Veitch*); Penang Mts., 2. ii. 1930 (*W. Greenwood*).

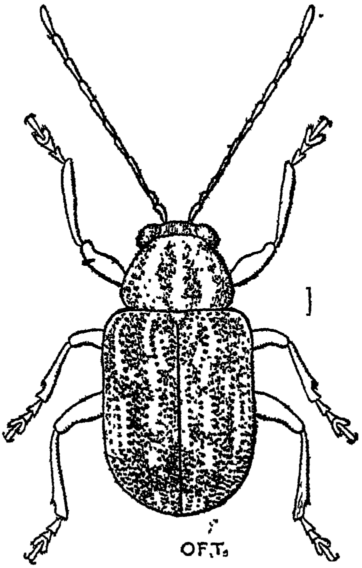
Distinguished from all the other species now described by the prothorax having a pattern formed by the adpressed scales.

*Demotina dissimilis*, sp. n. (Fig. 3.)

Oblong, subcylindrical; plum-brown, clothed with short adpressed whitish scales forming a pattern on the elytra, antennæ and legs fulvous; head feebly punctured, prothorax strongly and remotely punctured, elytra strongly punctate-striate. L. 3–3·25 mm.

Head plum-brown, feebly punctured, and clothed with adpressed whitish scales, a well-marked longitudinal median carina extending from the middle of the head to the base, clypeus clothed with longer hair-like scales; antennæ fulvous, long and slender, extending to the middle of the elytra, the first joint longer and more swollen than the second, the second about equal to the third, the fourth about equal to the second and third together, joints 3 to 6 more slender than the five terminal ones, the apical half of all the joints (with the exception of the basal ones) tinged with fuscous. Prothorax plum-brown, clothed with adpressed hair-like scales, strongly and remotely punctured, slightly transverse, with the sides rounded and contracted in front, widest behind the middle; scutellum plum-brown,

Fig. 3.

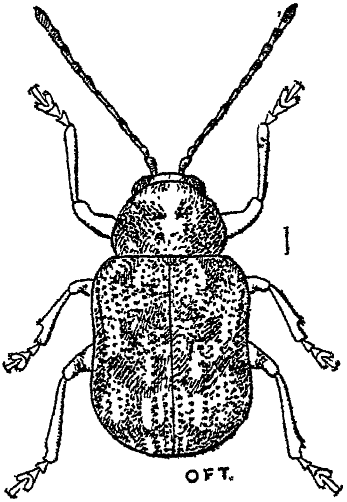


*Demotina dissimilis*, sp. n., ♂.

subquadrate, impunctate, clothed with whitish scales. Elytra oblong, wider than the base of the prothorax, plum-brown, clothed with adpressed whitish scales which form an irregular pattern, strongly punctate-striate. Legs and underside fulvous, the ventral segments of the abdomen glabrous, the first segment nearly twice as long as the second, the second to the fourth about equal.

♀. Differs in being stouter and broader, the antennæ shorter, and the pattern on the elytra more defined, forming two wavy transverse bands on the apical portion of the elytra (fig. 4).

Fig. 4.



*Demotina dissimilis*, sp. n., ♀.

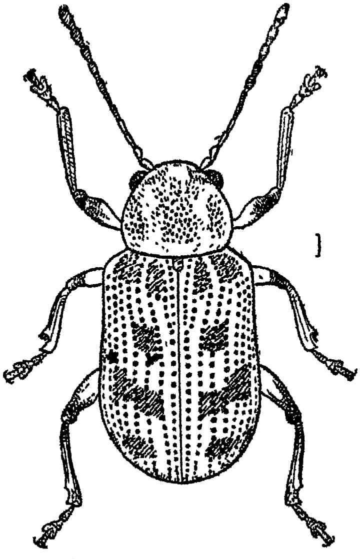
Fiji Is.: Waiyevo, Taveuni, 14.xi.1923 (*Dr. H. S. Evans*). Allied to *D. veitchi*, sp. n., but distinguished by its broader prothorax, less contracted at its base, and without the wavy white lines forming a pattern.

### *Demotina vitiensis*, sp. n. (Fig. 5.)

Oblong, subcylindrical; plum-brown, with darker markings forming patches and irregular transverse bands, the antennæ with the basal joints flavous; prothorax strongly punctured and clothed with fine whitish adpressed scales; elytra strongly punctate-striate and clothed with very short fine scales. L. 2·50 mm.

Head fuscous, clothed with short adpressed whitish scales, the clypeus transverse and glabrous; eyes prominent; antennæ slender, extending to the middle of the elytra, the four basal joints flavous, the seven terminal joints fuscous, the first joint longer and more swollen than the second, the third and fourth long and slender, the sixth a little shorter than the fifth, and the five terminal joints more swollen and about equal to each other. Prothorax slightly transverse, the sides rounded and slightly narrowed in front, strongly punctured, and clothed with fine whitish adpressed scales, the median portion of the base and sides darker; scutellum subquadrate, clothed with a few whitish scales. Elytra oblong, broader than the base of the prothorax and rounded at the apex, clothed with short adpressed scales, shorter than those on the prothorax, strongly punctate-striate, plum-brown, with darker patches at the shoulders, two patches between the base and the middle, and two transverse irregular bands behind the middle, and a small apical dark patch at the suture; legs more or less flavous, with the front femora and apical portions of the middle and posterior femora fuscous, middle and posterior tibiæ strongly notched on their outer side at the apex.

Fig. 5.



*Demotina vitiensis*, sp. n.

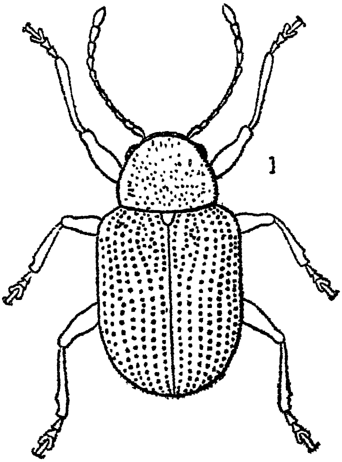
Fiji Is.: Naduruloulоa, Rewa, 2.i.1924 (*Dr. H. S. Evans*); Mt. Lautoka, 23. x. 1921 (*W. Greenwood*); Suva, 1. vi. 1927 (*H. W. Simmonds*); Nausori, v. 1921 (*R. Veitch*).

Smaller than *D. dissimilis* and with the joints of the antennæ shorter and more compact.

### *Demotina fulva*, sp. n. (Fig. 6.)

Oblong, subcylindrical; fulvous, clothed with golden adpressed scales, the scales more hair-like and longer on the prothorax than on the elytra; the prothorax strongly punctured, the elytra punctate-striate. L. 2 mm.

Fig. 6.



*Demotina fulva*, sp. n.

Head fulvous, covered with short golden hair-like scales, a central longitudinal carina, clypeus transverse almost smooth, with a few scattered punctures; antennæ fulvous, extending to the middle of the elytra, the first joint twice as long as the second, the first two joints more incrassate than the four following, which are elongate, the five terminal joints stouter. Prothorax slightly transverse, fulvous, strongly punctured, and clothed with rather long adpressed hair-like scales, the sides rounded and contracted in front, widest behind the middle. Scutellum subtriangular. Elytra fulvous, oblong, broader than the base of the prothorax, the shoulders rather prominent, strongly punctate-striate, clothed with short golden scales. Legs fulvous, slightly tinged with fuscous at the apex of the femora; underside fulvous, the ventral segments with scattered punctures, the first segment more strongly punctured than the others, and twice as long as the second, the segments 2–4 about equal to each other.

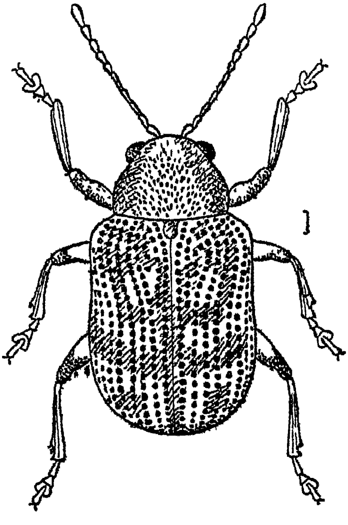
Fiji: Lebasa, xii. 1921 (*R. Veitch*).

May be distinguished from the other Fijian species by its small compact build and the short golden scales.

### *Demotina evansi*, sp. n. (Fig. 7.)

Oblong, subcylindrical, grey-black, opaque, with a ferruginous pattern on the elytra, clothed with adpressed short whitish scales; the antennæ, head, tibiæ, and tarsi ferruginous; prothorax broader than long, strongly punctured; the elytra grey-black with a ferruginous pattern, strongly punctate-striate, covered with short adpressed scales, forming longitudinal lines between the striæ. L. 2 mm.

Fig. 7.



*Demotina evansi*, sp. n.

Head opaque, rugose, ferruginous, covered with short adpressed whitish scales; eyes large and prominent; the antennæ ferruginous, not quite reaching the middle of the elytra, the first joint longer than the second, and both more swollen than the four following, which are slender, the five terminal joints more swollen and about equal to each other in length. Prothorax transverse, rugosely punctured, covered with short adpressed scales, broadest behind the middle and narrowed in front, grey-black, with the anterior margin and the middle of the basal margin more or less ferruginous. Elytra oblong, broader than the base of the prothorax, grey-black, with a vague ferruginous pattern, forming three irregular transverse bands, and the base ferruginous, strongly punctate-striate, with rows of short adpressed scales, arranged longitudinally between the striæ. Legs reddish, with the front femora and the apical portion of the middle and hind pairs fuscous; tibiæ and tarsi ferruginous, the middle and posterior tibiæ strongly notched at the apex, on their outer margin; underside fuscous.

Fiji Is.: Quilai, Taveuni, 800 ft., 18. x. 1924 (*Dr. H. S. Evans*).

In colour allied to *D. obscurata*, but without distinct white spots on the elytra, and its shape is more quadrate.

### *Demotina obscurata*, sp. n. (Fig. 8.)

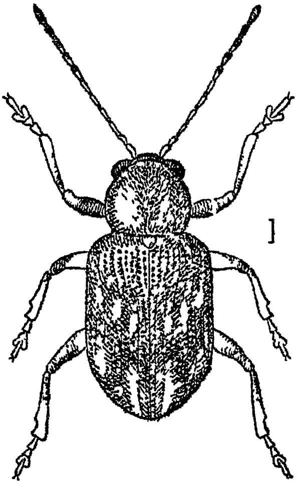
Oblong, subcylindrical, grey-black, covered with short white fine scales; the six basal joints of the antennæ, the tibiæ, and tarsi ferruginous; elytra punctate-striate, clothed with fine white scales, and each with five white patches of scales, three at the middle and two at the apex. L. 3 mm.

Head grey-black, clothed with fine white scales, the scales thicker and forming a white line near the inner margin of the eyes, a median longitudinal carina at the base of the head; the labrum ferruginous; the antennæ long and slender, extending just beyond the middle of the elytra, the six basal joints ferruginous, and the five terminal joints fuscous, the first two joints more swollen than the remainder, the first a little longer than the second, the third half as long again as the second, the third to the sixth long and slender, equal to each other, the four terminal joints shorter and stouter. Prothorax grey-black, finely punctured, covered with fine white scales longer than on the elytra, about as broad as long, the sides rounded. Scutellum subtriangular, clothed with a few white scales. Elytra oblong, tapering to the apex, wider at the base than the prothorax, grey-black, strongly punctate-striate, clothed with fine white scales, six dense white patches of scales forming a V-shaped macular band at the middle, and four at the apex, the two at the apex of the suture longer. Legs ferruginous, with the apical half of the femora fuscous, the middle and hind tibiæ strongly notched at the apex. Underside fuscous.

Fiji Is.: Waiyevo, Taveuni, 800–1000 ft., 16. iii. 1924 (*Dr. H. S. Evans*).

Allied to *D. evansi*, but of more oblong build, and with distinct white spots forming a pattern on the elytra.

Fig. 8.



*Demotina obscurata*, sp. n.

### *Demotina albonotata*, sp. n.

Oblong, convex, black, nitid, clothed with very fine scales; antennæ ferruginous except the four basal joints, which are flavous; the clypeus, labrum, tibiæ, and tarsi ferruginous; the elytra each with three tufts of silky white scales, the first just before the middle, the second between the middle and the apex near the side-margin, the third at the apex not touching the suture. L. 2·75 mm.

Head black, rugosely punctured, with a strong median longitudinal carina, a white patch of scales near the inner margin of each eye; the clypeus ferruginous, glabrous, with a few scattered punctures; labrum ferruginous, transverse, palpi flavous. Antennæ slender, extending to the middle of the elytra, the four basal joints flavous, the seven terminal joints fuscous, the first two joints incrassate, joints 3 to 6 slender, and the five terminal joints more swollen, about equal to each other in length, and more pubescent than the six basal ones. Prothorax black, nitid, slightly transverse, the sides slightly rounded, converging in front; the surface coarsely rugose-punctate, covered with fine greyish scales. Scutellum black, subquadrate, impunctate. Elytra elongate, tapering to the apex, black, nitid, covered with fine scales, punctate-striate; each elytron with three white patches of silky scales, arranged as follows, viz.:—one just before the middle, the second between the middle and the apex, near the side-margin, the third at the apex, but not touching the suture or the apical margin, the second and third patches more elongate than the first. Legs with the femora black, tibiæ and tarsi ferruginous, the coxæ ferruginous. Underside black and glabrous.

Fiji: Loloti, 19. xii. 1920 (*W. Greenwood*).

Differs from all the other species now described by its black, shining, nearly glabrous body, with well-defined white patches of scales. It is closely allied to *D. ornata*, Baly, from Ceram.

## XLVII.—*On* Urosthenes, *a Fossil Fish from the Upper Coal Measures of Lithgow, New South Wales.* By Sir Arthur Smith Woodward, LL.D., F.R.S.

[Plate XIV.]

I am indebted to the Government Geologist of New South Wales for the opportunity of studying a new specimen of the ganoid fish *Urosthenes*, from the Newcastle Coal Measures at Lithgow, New South Wales, which is interesting as suggesting that the systematic position of this genus has hitherto been wrongly determined. It is also important because the original specimen was accidentally destroyed in a fire.

The fish is well displayed in direct side view on a slab of fine-grained rock, and lacks only the head with the anterior half of the abdominal region. It is shown of a little more than one-half the natural size in Plate XIV. The anterior end is obliquely truncated by fracture, and the anterior part of the dorsal border may perhaps be a little crushed downwards, but the regularity of the squamation seems to show that there is no other distortion. The maximum depth of the trunk is thus at the origin of the dorsal and anal fins, which are almost directly opposed, and the upturned lobe of the heterocercal tail is remarkably thick at the base.

Beneath the squamation there are no recognizable traces of the endoskeleton, which must have been scarcely if at all calcified.

The fins are relatively large and consist of stout spaced rays, which bifurcate two or three times distally. The rays are ornamented with fine longitudinal ridges, and crossed by numerous articulations, between which none of the segments are much longer than wide, most of them, indeed, wider than long. There are no fin-fulcra. The pelvic fin arises much nearer to the anal than the latter to the caudal, and there is an irregularity in contour at its base, though no clear evidence of a scaly lobe. It comprises at least 18 rays, all bifurcating except the foremost 3 or 4, which are crowded and gradually increase in length to the first and longest bifurcated ray. The hindmost rays rapidly decrease in size. The dorsal and anal fins seem to have a low scaly lobe at the base and are nearly symmetrical, the dorsal being only the slightly more extended and the anal perhaps a little the deeper in front. They are rounded, not acuminate, in front, and not very low behind. The dorsal fin comprises about 36 rays, of which the foremost 7 are simple, crowded, and gradually increasing in length to the first and longest bifurcated ray; the hindmost 5 or 6 are comparatively weak and are inserted round the posterior end of the basal lobe. The anal fin has about 30 rays, of which the foremost are also crowded. None of the fin-supports are seen. The caudal fin is restricted to the lower border of the upturned caudal lobe, and is truncated behind, the apex of the lobe not extending beyond this truncation. It comprises about 40 rays, of which a few of the foremost are crowded, while the hindmost are comparatively delicate.

Thin scales are regularly arranged over the whole of the trunk and the lobes of the median fins. None are thickened or enlarged even on the ridge of the back or on the border of the upper caudal lobe. The only marked feature is the simple lateral line which extends along the flank just above its middle and ends abruptly at the caudal fin below the upturned caudal lobe. The scales in their crushed condition are difficult to interpret, but they seem to be elongate-ovoid or very obliquely rhombic in shape and deeply overlapping. They are marked in their exposed portion with well-spaced, sharp, delicate ridges, which are parallel with the postero-superior and postero-inferior edges, and so produce a chevron-pattern. There are no traces of the fine concentric lines of growth. The scales diminish in size towards the caudal pedicle, but both here and on the upper caudal lobe they retain their characteristic shape and ornament. There is no sharp line of demarcation across the squamation at the base of the upper caudal lobe.

If the new specimen now described had not been found in the same formation as the original specimen of *Urosthenes australis* it could scarcely have been referred to this genus. It can only be thus determined by assuming that in several respects the original specimen was so imperfectly preserved that Dana's description and figure of it are misleading*. The peculiarly stumpy upturned caudal lobe, however, and the median fins so far as shown, are so similar in the two specimens that they seem to represent the same genus, though the greater relative depth of the trunk figured in Pl. XIV. and the closer approximation of its pelvic and anal fins justify its reference to a distinct species, which may be named *U. latus*.

If this reference be correct the systematic position of *Urosthenes* needs further discussion. It has hitherto been regarded as an Acipenseroid of the family Palæoniscidæ. The new specimen shows that it differs from all Acipenseroids in the absence of enlarged or thickened ridge-scales on the upturned caudal lobe, and in the lack of a line of demarcation between the squamation of this lobe and that of the rest of the caudal region. It is also peculiar in showing a slight lobe at the base of the dorsal and anal fins. These, however, are characteristics of the Crossopterygii, and the scales are more closely similar to those of certain Crossopterygians of the families Rhizodontidæ and Cœlacanthidæ than to those of any known Acipenseroid. I am therefore inclined to assign *Urosthenes* to a new family of Crossopterygii, the Urostheneidæ. It differs from all known Crossopterygian families in having the caudal fin restricted to the lower border of the caudal lobe, though there are some Devonian genera (e. g., *Osteolepis*) in which the portion of caudal fin on the upper border is reduced to a minimum. The fin-rays are also stouter and less crowded than in most Crossopterygii, but they closely resemble those of *Holoptychius* as displayed in specimens from the classic locality of Dura Den.

## EXPLANATION OF PLATE XIV.

*Urosthenes latus*, sp. n.; trunk in right side view, about one-half nat. size.—Upper Carboniferous (Newcastle Coal Measures); Lithgow, New South Wales.

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* J. D. Dana, Wilkes' United States Exploring Expedition, Geology, vol. x. (1849), p. 681, with figure, which is copied by O. Feistmantel in Mem. Geol. Surv. N.S. Wales, Palæont. no. 3 (1890), pl. xxix. fig. 7. Description reprinted in Ann. & Mag. Nat. Hist. ser. 2, vol. ii. (1848), p. 149.

## XLVIII.—*A new* Adoretus (*Col.*, Rutel.) *from the Sudan.*

By Dr. F. Ohaus.

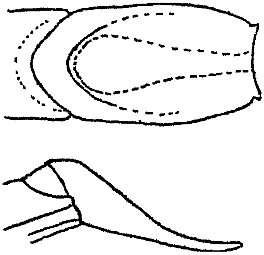
### *Adoretus depilatus*, sp. n.

*Ad. luteipes*, Lap., proxime affinis. Oblongo-ovalis subparallelus modice convexus, rufo-castaneus vertice levissime cuprascens, femoribus tibiis antennisque flavis, supra et subtus subdense griseo-pilosus, elytrorum costæ primariæ discales maculis depilatis parvis ornatæ.

Long. 9½–11, lat. 4½–5 mm.

♂. Anglo-Egyptian Sudan: Talodi, 11–20. v. 1930, on ground (*F. G. S. Whitfield*); Wau (Coll. *J. N. Ertl*); Bahr-el-Djebel, 22. iii. 1910.

Belonging to the *tessulatus*-group, and in this next allied to *luteipes*, Lap., differing especially by the anterior border of the clypeus less produced, the hairless patches on the elytra smaller and not shining, the erect setæ on the disk of the pygidium longer and more densely set. Oblong-ovate, nearly parallel-sided, upper and underside reddish chestnut-brown, the femora, tibiæ, and antennæ yellowish, sparsely covered with short greyish hairs, densely and confluently punctured. Clypeus flat, finely bordered, with the anterior margin somewhat flatter than a semidiameter; vertex hairless, somewhat coppery, shining. On the elytra the primary costæ are faintly convex, the fine striæ limiting these costæ are hairless, the costæ bear small hairless patches which are neither darker nor more brilliant. Pygidium covered with erect hairs, greyish at the base and sides, becoming longer and reddish on the disk. In the ædeagus (see figure) the sides are dilated, while in *luteipes* they are parallel, and bear on the outer edge a little tooth.



*Adoretus depilatus*, sp. n.

Type in the collection of the Imperial Institute of Entomology (British Museum, Natural History) in London; co-types in the author's collection.

## XLIX.—*Notes on Old-World Œstromuscoid Types.*—Part I.

By Charles H. T. Townsend.

In the 'Revista de Entomologia' (São Paulo. Brazil), vol. [illegible] nos. 1 & 2, there appear under the present authorship "Notes on American Œstromuscoid Types," the prefatory remarks in which apply in all respects to the present paper, which is in conclusion of the notes there begun. It is, however, advisable to repeat here the following points:—

The species are taxonomically arranged under the original binomial. The correct binomial is distinguished by an asterisk (*), whether it be the original one or not, except in cases of new genera and species published elsewhere. When (gt) follows a binomial, the species is the genotype of the genus with which it is coupled. Type-locations are designated by the cities in which the types are housed. Ht, At, and Pt mean holotype, allotype, and paratype respectively. Capitalized abbreviations are used for chætotactic and venational characters; they have been explained in 'Supplementa Entomologica,' nos. 14 & 16, and 'Revista de Entomologia,' no. 1.

### Superfamily **MUSCOIDEA.**

### Family **Muscidæ.**

### Tribe Muscini.

*Musca cyanea*, Fab.—Male Ht in Copenhagen Fab. Coll., labelled "ex Cap: b: sp:," has prosternum bristled, postalar wall faintly short-setose anteriorly below, tympanic ridge thickly bristled, tympanic pit bare; greater ampulla large, oval, swollen, raised, and pilose. **Lasiopyrellia cyanea*, Fab. (gt).

*Musca lauta*, Wied.—Female Ht in Copenhagen Westermann Coll., from Java, is new genus published elsewhere. Prosternum and tympanic ridge bristled.

*Musca planiceps*, Wied.—Male Ht in Copenhagen Westermann Coll., labelled "Batavia: Aug. 1816," is *Musca indica*, Awati. Prosternum bristled, squamopleura very convex and thickly pilose. **Awatia planiceps*, Wied. (gt).

*Musca corvina*, Port. (nec Fab.).—This composite, restricted by me in 1911 and 1915 to the species described by Portschinsky in 1910 as *Musca ovipara*, is *Musca autumnalis*, DeG. IPAL strong, RM with 2 setæ or so. **Eumusca autumnalis*, DeG. (gt). *Emusca*, Mall., is synonym of *Eumusca*, TT.

### Tribe Stomoxydini.

**Glossinella schillingsi*, Grünb. (gt).—Female Ht in Berlin and female Pt in Lima, from Tanganyika Territory, have propleura and prosternum bare, body feebly black-bristled, mouth of 5 R twice as wide as length of R 6, five hairs on upper side of arista and none below, head nearly half again as wide as high, vertex 2/5 head-width, no PFRO, parafacialia narrowed to a point below, cheeks 1/10 eye-length, 4 PS, 2 ST, 2 PRI (middle one absent). Very distinct from *Lyperosia minuta*, Bezzi, which is a *Haphospatha*, End. Abundantly distinct generically from *Lyperosia*, Rdi., which has head little wider than high, female vertex 1/4 head-width and 3 to 4 PFRO, cheeks nearly 1/6 eye-length, 3 strong and 4 short PS, mouth of 5 R little wider than length of R 6.

*Bdellolarynx sanguinolentus*, Aust. (gt).—Female Ht in London, from India, is *Hæmatobia nudinervis*, Stein, female Ht in Berlin, from Formosa. Prosternum with very short setæ. Distinguished at once from *Hæmatobia*, P. & S., by the oral profile being rounded upward anteriorly instead of long and straight. **Bdellolarynx nudinervis*, Stein (gt).

**Stygeromyia maculosa*, Aust. (gt).—Male Ht in London, from Arabia, has both prosternum and propleura pilose, pteropleural hairs long, hypopleural hairs short, lateral postscutellar plates and squamopleura bare.

**Haphospatha hirudo*, End. (gt).—Female Ht in Berlin, from Cameroons, is yellow-bristled, 2 long yellow PFRO, vertex little over 1/4 head-width, prosternum and propleura bare.

**Bdellia prædatrix*, End. (gt).—Male Ht and female At in Berlin, from Cameroons, have propleura, tympanic ridge and pit bare; postalar wall pilose on middle, and pallid testaceous coloration.

## Family Gasterophilidæ.

### Tribe GYROSTIGMATINI.

**Spathicera pavesii*, Corti (gt).—Female Ht in Genoa (?), from South Abyssinia, not seen. A female in Paris, from Abyssinia, is 18 mm. long with abdomen curled under at tip, the abdomen 6 mm. wide, wings 21 mm. long and 5$\frac{3}{4}$ mm. wide; vertex over 1/3 head-width; frontalia nearly equibroad and nearly filling whole width of front posteriorly, over posterior 1/2 setose especially on the prongs each side of ocellar triangle; ocelli absent; propleura with a few hairs, postalar wall long-bristled, tympanic ridge and pit bare, sternites and ventral membrane exposed. A third fly of *Spathicera* is in Stockholm, reared from larva taken from stomach of black rhino and described by Sjöstedt as *S. meruensis*. Judging from larval characters, *Spathicera*, Corti, is a valid genus distinct from *Gyrostigma*, Brauer, whose fly has not yet been reared.

## Family **Rhiniidæ.**

### Tribe BENGALIINI.

*Musca jejuna*, Fab.—Female Ht and 2 female Pts in Copenhagen Fab. Coll., labelled "*Musca jejuna*" and heading the specimens under *Musca* in the Fab. Coll., are the original types of Fabricius; the smallest of these 3 females is *Bengalia lateralis*, Macq., and is hereby excluded, the species being restricted to the other 2 which measure 14 mm. and are *jejuna*, Fab., Wied., Macq., Surc. Surcouf saw one of those 2, as proved by his giving length of 14 mm. It is evident that the Tranquebar specimen mentioned in the note at end of Wiedemann's description is the above specimen of *lateralis* here excluded. That the type was not destroyed at Kiel is proved by there being no sign of either label or specimen in the remains of the Fabrician material there, which I thoroughly searched. *Bengalia recurva*, Mall., seems to be this species. The light parts of abdomen show silvery-white pollinose in side view, especially on sides and venter. The species runs 13 to 15 mm. and has epistoma practically full width of clypeus, while *lateralis* runs 10 to 13 mm. and has epistoma strongly narrowed from clypeus. **Ochromyia jejuna*, Fab. (gt).

*Musca varicolor*, Fab.—Male Ht in Copenhagen Fab. Coll., labelled "e Tranqueb: Daldorff," is *Bengalia labiata*, RD. (gt), Ht from Bengal and lost. Wiedemann wrongly gave the sex as female. Propleura bare, prosternum pilose on disk posteriorly, postalar wall pilose, tympanic ridge and pit bare; base of fulcrum projecting below, not before, the oral margin; head nearly half again as wide as high, R 5 bristled to or beyond R 6 both above and below; abdomen pale ferruginous-testaceous, the narrow hind borders of all 4 segments black, last 3 segments with an almost rose tint, light parts silvery pollinose. **Bengalia varicolor*, Fab. (gt). Male with 1 PFRO.

*Musca favillacea*, Wlk.—Female Ht in London, from Macassar, is *Bengalia lateralis*, Macq., female Ht in Paris, from Pondicherry. *Homodexia obscuripennis*, Big. (gt), male Ht in Newmarket, from Ceylon, is same species. Prosternum and postalar wall finely pilose, latter thickly so; tympanic ridge bare but pit pilose on outer rim. **Anisomyia lateralis*, Macq. (gt).

*Bengalia depressa*, Wlk.—Male Ht in London, from Central Africa, appears to be *spurca*, BB., as identified by Malloch. Male genitosternite nearly square and with notch on middle of hind border; base of fulcrum not projecting beyond epistoma. **Eubengalia depressa*, Wlk. (gt).

**Caiusa indica*, Surc. (gt).—Female Ht in Paris, from India, is distinct from *Ochromyia analis*, Macq., female Ht in Paris, from Australia. Propleura faintly short-pilose; prosternum, squamopleura, lateral postscutellar plates, and postalar wall all pilose.

*Kenia flavida*, Mall. (gt).—Male Ht in London, from Kenya, is *Hemigymnochæta lutea*, Corti, female Ht in Genoa (?), from South Abyssinia, not seen. Agrees with the characters given by Corti, which are quite distinctive.

### Tribe RHINIINI.

*Musca lunata*, Fab.—Male Ht in Copenhagen Fab. Coll., labelled "e Madera: Rathke," has propleura, postalar wall, tympanic ridge and pit bare; prosternum and pteropleura pilose. **Stomorhina lunata*, Fab. (gt).

*Musca ruficeps*, Fab.—Female Ht in Copenhagen Fab. Coll., labelled "e Bourdeaux: Horneman," is *Rhyncomya felina*, RD. (gt), also from Bordeaux. Propleura bare, prosternum pilose, IPAL developed. **Rhyncomya ruficeps*, Fab. (gt).

*Musca abdominalis*, Fab.—Female Ht in Copenhagen Fab. Coll., from East Indies, has prosternum bristled, propleura and postalar wall bare, no IPAL, 3rd and 4th sternites covered. **Thoracites abdominalis*, Fab. (gt).

*Dictya ænea*, Fab.—Female Ht in Copenhagen Fab. Coll., labelled "e Guinea: Krieger," is a *Cosmina*, RD., distinct from the genotype. Propleura sparsely pale-pilose. *Cosmina ænea*, Fab.

*Musca punctulata*, Wied.—Female Ht, male At, and male Pt in Copenhagen Westermann Coll., from Cape of Good Hope, are not *Dictya ænea*, Fab., but are congeneric therewith; *ænea* is a tropical species, while *punctulata* is from the Cape region. Propleura bare. *Cosmina fuscipennis*, RD., is same species. **Cosmina punctulata*, Wied. (gt).

*Idia anchora*, Wied.—Female Ht in Copenhagen, labelled "Guin:," is a *Cosmina*, RD., distinct from both of the foregoing. **Cosmina anchora*, Wied.

*Idia apicalis*, Wied.—Male Ht in Wien, from Teneriffe, is *Rhinia testacea*, RD. (gt), from Mauritius. Prosternum thickly bristled, propleura and postalar wall bare. **Rhinia apicalis*, Wied. (gt).

*Idia xanthogaster*, Wied.—Female Ht in Copenhagen Westermann Coll., from Java, is *Idiella* *iopsis similis*, TT. (gt), male Ht and female At in Calcutta Ind. Mus., from India. Prosternum long-pilose on edges. **Idielliopsis xanthogaster*, Wied. (gt).

*Tachina viridaurea*, Wied.—Female Ht in Copenhagen, labelled "ex Ind: or:," comes nearest to *Rhyncomya*, RD. Epistoma

*Phasia*-like, wide and nearly as long as clypeus; vertex not 1/3 head-width, front at base antennæ over 1/3; practically no facial carina, but antennæ separated at base, arista long-pubescent, FRS stopping at base antennæ, cheeks over 1/2 eye-length, PRA present; 3 LS, HLS longest and decussate; MR on 4th segment, only short hairs on intermediate segments, hypopygium small, 5 R very narrowly open, squamæ narrow and rounded behind. **Rhyncomya viridaurea*, Wied.

*Idia prolata*, Wlk.—Female Ht in London, from Macassar, is *Chloroidia flavifrons*, TT. (gt), female Ht and male At in Calcutta Ind. Mus., from Cochin State and Lower Burma respectively. Prosternum bristled, propleura and postalar wall bare, no IPAL. **Chloroidia prolata*, Wlk. (gt).

*Idia bivittata*, Wlk.—Male Ht lacking abdomen and male Pt in London, from Borneo, are *Borbororhinia pubescens*, TT. (gt), male Ht in Calcutta Ind. Mus. and male Pt in Washington USNM, from Cochin State. Prosternum finely pilose on edges; abdomen thickly set with erect black fur-like pile, narrowed to tip. **Borbororhinia bivittata*, Wlk. (gt).

*Rhyncomya aberrans*, Sch.—Male Ht, from Shanghai, not to be found in Wien. **Arrhinidia aberrans*, Sch. (gt).

**Thelychæta chalybea*, BB. (gt).—Female Ht in Wien, from Borneo, has prosternum thickly bristled, postalar wall thinly pilose, a few pale hairs on lateral postscutellar plates, no IPAL.

*Euidiella unicolor*, TT.—Female Ht in Calcutta Ind. Mus., from Borneo, is *Idiella cyanea*, Stein, female Ht in London, and distinct from *Idia simplex*, Wlk., male Ht in London lacking head. Walker's *simplex* has upper parts greenish testaceous, 4 narrow blackish thoracic vittæ, and scutellum is not pitted; Stein's *cyanea* has upper parts deep bluish, no distinct thoracic vittæ, and both thorax and scutellum are pitted. **Euidiella cyanea*, Stein.

## Tribe POLLENIINI.

**Pollenomyia sinensis*, Seguy (gt).—Male Ht in Paris (head crushed), from China, has propleura and lateral postscutellar plates pilose, squamopleura and tympanic ridge bare, postalar wall pilose on middle and on upper part posteriorly, tympanic pit long-pilose on inner and outer rims, RM and IPR bare, squamæ small but widened behind and as long as wide, 2nd to 4th sternites overlapping tergites.

**Paraphumosia waterloti*, Seguy (gt).—Female Ht in Paris, from Madagascar, has propleura, prosternum, squamopleura, and lateral postscutellar plates all pilose; postalar wall setose on middle, tympanic ridge and pit bare, RM and IPR bare.

**Decaryella cinerea*, Seguy (gt).—Female Ht in Paris, from Madagascar, has propleura, prosternum, squamopleura, and lateral postscutellar plates pilose.

**Denatella alluandi*, Seguy (gt).—Female Ht in Paris, from East Africa, has same parts as preceding and also postalar wall pilose.

*Lispoparea flava*, Ald. (gt).—Male Ht in Washington USNM, from China, is *Dexopollenia*, TT., distinct from genotype. **Dexopollenia flava*, Ald.

**Xanthotryxus mongol*, Ald. (gt).—Male Ht and female At in Washington USNM, from China, have antennæ well separated at base, greater ampulla large and raised, 1st sternite not greatly wider than 2nd.

## Family **Calliphoridæ**.

### Tribe CHRYSOMYINI.

*Musca albiceps*, Wied.—Male Ht in Wien, from Cape of Good Hope, has prosternum long-pilose on edges, postalar wall thickly pilose, tympanic ridge sparsely setose, RM ciliate, IPR black-setose on outer edge, squamæ white-hairy on disk, propleura bare. **Achætandrus albiceps*, Wied. (gt).

**Chrysopyrellia saphyrea*, Seguy (gt).—Female Ht in Paris, from Madagascar, has propleura pilose, RM bare, 4 strong HPL, squamæ small and pilose on middle of disk especially.

**Hemichrysomyia pachymera*, Seguy (gt).—Male Ht in Paris, from Madagascar, has propleura pilose, RM ciliate, IPR bare, squamæ pilose on whole upper surface.

### Tribe CALLIPHORINI.

*Musca leonina*, Fab.—Ht in Kiel, only shell of thorax and right wing remaining on pin, and labelled "*lonina*," has propleura pilose, prosternum well bristled, lateral postscutellar plates short-setose, postalar wall thickly bushy-haired, tympanic ridge and pit bare, greater ampulla well raised, RM bare, infrascutellum wide but flat. **Amenia leonina*, Fab. (gt).

*Musca stygia*, Fab.—Female Ht in Kiel, without label, but in perfect state of preservation, has propleura and postalar wall pilose, prosternum thickly pilose on disk, RM and IPR bare; squamæ pale-hairy, large, widened and squared behind. **Neopollenia stygia*, Fab. (gt). From Australia (Wiedemann gave Newfoundland in error).

*Musca fuscipennis*, Fab.—Female Ht in Copenhagen Fab. Coll., labelled "e Sumatra: Daldorff," has propleura thickly pilose, prosternum thickly bristled on disk, postalar wall heavily bristled and 2 macrochætæ on middle; RM, IPR, tympanic ridge and pit bare; heavy facial carina present. **Sillbomyia fuscipennis*, Fab. (gt). Engel was mistaken in believing this to be the female of the following species, which is very distinct.

*Musca micans*, Fab.—Male Ht in Copenhagen Fab. Coll., labelled "ex Ind: or.," is *Catapicephala splendens*, Macq. (gt), male Ht in Newmarket, from Java; and *Trongia viridis*, TT. (gt), male Ht in Washington USNM, from Siam. Propleura bare, prosternum bristled on edges, lateral postscutellar plates with a tuft of pile. **Catapicephala micans*, Fab. (gt). No facial carina.

*Musca sacra*, Fab.—Female Ht in Copenhagen Fab. Coll., labelled "ex Cap: b. sp.," is *Musca quadrimaculata*, Swed., female Ht in London, from New Zealand (Fab. locality in error). The Swederus Ht has the arista long-plumose 3/4 way, and the Fabricius Ht only 2/3 way. Is new genus published elsewhere.

*Musca azurea*, Fall.—Ht in Stockholm, from Sweden, has propleura setose, prosternum bristled, 4 to 5 PS. **Protocalliphora azurea*, Fall. (gt).

*Tachina westermanni*, Wied.—Male Ht and male Pt (wrongly det. female) in Copenhagen Westermann Coll., labelled "Cape Good Hope: Jan. 1817," are new genus published elsewhere. The infrascutellum is recessive.

*Tachina obsoleta*, Meig.—Male Ht in Paris, from Germany, has recessive infrascutellum and squamæ pilose on middle of disk. **Bellardia obsoleta*, Meig. (gt). *B. vernalis*, RD. (gt), Ht lost, is a synonym.

*Sarcophaga genarum*, Zett.—Male Ht and female At in Lund, from Sweden (Mullfj), have propleura thinly short-pilose, prosternum bare, lateral postscutellar plates pilose. **Abonesia genarum*, Zett. (gt).

*Cynomya fortis*, Wlk.—Ht in London, from Borneo, is *Pyrellia fumipennis*, Wlk., Ht in London, from New Guinea, and *Hypopygiopsis splendens*, TT. (gt), male Ht in Washington USNM, from Siam. Propleura, prosternum, and squamopleura pale-pilose; lateral postscutellar plates black-pilose, squamæ bare, no IPAL nor PTL. **Hypopygiopsis fortis*, Wlk. (gt).

*Musca macularis*, Wlk.—Female Ht in London, from Aru Islands, is *Paramenia semiauriceps*, BB. (gt), female Ht in Wien, from Australia. Propleura bare, prosternum with only a pair or two of small setæ, lateral postscutellar plates pilose, postalar wall very thickly long-pilose; RM, IPR, tympanic ridge and pit bare. **Paramenia macularis*, Wlk. (gt). *Calliphoropsis*, TT., is synonym.

*Musca delectans*, Wlk.—Ht not to be found in London, from Celebes. **Isomyia delectans*, Wlk. (gt).

*Ochromyia lateralis*, Macq.—Female Ht in Paris, from Sydney, and hereby designated genotype of *Proekon*, Surcouf, is *Musca augur*, Linn., and *Anastellorhina bicolor*, Big. (gt), female Ht in Newmarket, from Australia. *Proekon* is synonym of latter genus. **Anastellorhina augur*, Linn. (gt).

*Ochromyia flavipennis*, 2d Macq. preoc.—Female Ht in Paris and female Pt in Lima, from Tasmania, are *Ochromyia hyalipennis*, 2d Macq. preoc., male Ht in Paris, also from Tasmania, and *Calliphora ochracea*, Sch., male Ht and female At in Wien, from Sydney. Propleura bare, prosternum pilose on disk, postalar wall thickly long-pale-pilose, RM and tympanic ridge bare, tympanic pit bearing hairs on outer rim. **Neocalliphora ochracea*, Sch. (gt). *Amphibolosia*, Surc., is a synonym of *Neocalliphora* BB.

**Platytropesa auriceps*, Macq. (gt).—Male Ht in Paris, from Triton Bay, labelled "*auriceps*" and in perfect preservation, being species published as *ruriceps* by typographical error, has propleura and lateral postscutellar plates pilose, postalar wall and edges of prosternum thickly long-bristled; squamopleura, tympanic ridge and pit bare; greater ampulla swollen and raised, sternites wide and widely exposed, 3 ST, 2 FRS below base antennæ, epistoma well narrowed from clypeus, facial carina extremely heavy.

*Catapicephala limbipennis*, Thom.—Female Ht in Stockholm, from Honolulu, has propleura sparsely setose, lateral postscutellar plates and edges of prosternum bristled. **Dyscritomyia limbipennis*, Thom. (gt).

**Prosthetochæta robusta*, Grimsh. (gt).—Ht in London, from Hawaii, has propleura thinly pilose, prosternum thinly hairy and bristled, lateral postscutellar plates with vertical strip of pile; greater ampulla swollen, raised.

**Steringomyia stylifera*, Pok. (gt).—Male Ht in Budapest, from Alps, not seen; males in Wien have propleura pilose, prosternum both bristled and pilose on disk, 1 short PST, 3 PS and ST, no IPAL, vertex nearly 1/4 head-width, IVRS straight.

**Acrophaga stelviana*, BB. (gt).—Male Ht in Wien, from Alps, has prosternum bare, propleura setose, postalar wall bristled, tympanic ridge bare but pit bristled.

**Chopardia æenescens*, Surc. (gt).—Female Ht in Paris, from Madagascar, has propleura and prosternum pilose, squamopleura long-pilose, postalar wall pilose on centre.

**Hemipyrellia curriei*, TT. (gt).—Female Ht in Washington USNM, from Liberia, has propleura, squamopleura, and lateral postscutellar plates pilose; prosternum and RM bare, IPR set with short black setæ.

**Roubaudiella cærulea*, Seguy (gt).—Female Ht in Paris, from French Congo, has propleura bare, prosternum bristled, greater ampulla swollen and raised.

## Family **Stephanostomatidæ.**

### Tribe AGRIINI.

*Wohlfahrtia curtata*, Vill.—Ht in Rambouillet, from South Africa, is **Afrowohlfahrtia pachytyli*, TT. (gt), male Ht and female At in Washington USNM, from Transvaal. Propleura and prosternum bare, lateral postscutellar plates bristled.

*Dasysceloctis maculipennis*, End. (gt).—Male Ht and female At in Berlin, from Lake Nyassa (Fulleborn), are *Pœcilometopa*, Vill., and differ anatomically from *Sarcophaga spilogaster*, Wied., male Ht in Copenhagen Westermann Coll., from Cape of Good Hope, only by lateral postscutellar plates setose in both sexes, propleura bare in male and pilose in female, plumosity of arista a little shorter, and weak bristles in MR of 1st hypopygial tergite of male. Wied. Ht has lateral postscutellar plates bare, propleura pilose, arista long-plumose little over 1/2 way, and only hairs on 1st hypopygial tergite. Enderlein's species is the tropical representative of Wiedemann's. Its colour is brown to brownish grey. **Pœcilometopa maculipennis*, End. *Sceloctis*, End., and *Dasysceloctis*, End., are synonyms of *Pœcilometopa*, Vill.

### Tribe STEPHANOSTOMATINI.

*Musca striata*, Fab.—Female Ht in Copenhagen Fab. Coll., from Europe, is *Sarcophaga hæmatodes*, Meig., Ht in Paris, from Germany. Propleura and prosternum bare, no IPAL. **Ravinia striata*, Fab. (gt).

*Tachina pusilla*, Wied.—Male Ht in Wien, labelled "Ind : or" and "*pusilla* Wd. 287. Coll. Winthem," measures 2¾ mm., has 1 PFRO and 1 RFRO, 5 R closed length of M 3 before wing-tip, propleura and lateral postscutellar plates bare, 2 ST, arista short-plumose 1/2 way, M 3 midway or nearer R 6. Locality of West Indies given by Wiedemann in error. It is from the East Indies. **Sarcophilodes pusilla*, Wied. (gt).

*Sarcophila alba*, Sch.—Male Ht and female At in Wien, from Ceylon, are *Musca cinerea*, Fab., Ht not in Kiel, from East Indies. Propleura and tympanic ridge bare, prosternum with a few pale hairs posteriorly, postalar wall thinly haired on centre, no IPAL. **Leucomyia cinerea*, Fab. (gt).

*Blæsoxipha grylloctona*, Loew (gt).—Female Ht in Berlin, from Germany, is *Sarcophaga laticornis*, Meig., male Ht in Paris, also from Germany. Propleura bare, prosternum with a pair or two of black microsetæ, lateral postscutellar plates setose, no IPAL. **Blæsoxipha laticornis*, Meig. (gt).

*Sarcophaga granulata*, Kram.—Male Ht in Berlin, from Europe, is *Hartigia*, RD., but distinct from genotype. **Hartigia granulata*, Kram.

*Heteronychia chætoneura*, BB. (gt).—Male Ht in Wien, from Austria, is *Sarcophaga dissimilis*, Meig., male Ht in Paris, from Germany. Propleura bare, prosternum bristled, IPAL developed but short. **Hartigia dissimilis*, Meig. (gt). *Heteronychia*, BB., and *Kramerella*, End., are synonyms of *Hartigia*, RD. *H. concolor*, RD (gt) is a synonym of *dissimilis*, Meig.; as stated by Desvoidy (Posth. ii. 521) the male hind tibiæ are not long-villous, yet Enderlein wrongly states the contrary through some curious *lapsus* (Klass. Sarc. 46).

*Sarcophaga aurifrons*, Doll., End.—Male Ht and female At in Berlin, from Amboyna, have propleura bare in the male and pilose in the female, no OCS in the male but strong ones in the female; prosternum and lateral postscutellar plates are bristled in both. The female is evidently a distinct form. Enderlein states in his description that the male lacks ctenidium on middle femora, but it is present and strong in the Ht. Middle and hind tibiæ of male thickly long-villous. The Doleschall Ht in Wien was not seen by me. **Lioproctia aurifrons*, Doll., End. (gt).

*Musca striata*, End., nec Fab.—Male Ht in Berlin, from Europe, has propleura bare, prosternum sparsely microbristled on edges, lateral postscutellar plates setose, no PRA, erect decussate APS 2 FRS below base antennæ, hind tibiæ long-villous, lobes of 5th sternite thickly short-spined on inner-apical angle; anal forceps stout, truncate on tip, with short tooth on ventro-apical angle. Contrary to what Enderlein states in his description, the middle femora bear a ctenidium of 7 spines. The species runs to *striata* in Stein's key (Tach. Mitteleurop. 196), and may be known as **Thyrsocnema transita*, TT. (gt), nom. nov.

### Tribe MYORHININI.

**Blæsoxiphella brevicornis*, Vill. (gt).—Male Ht in Rambouillet, from South Russia, has propleura, prosternum, and lateral postscutellar plates bare; bristles of head and abdomen reduced, short and stubby, in all which characters it agrees with *Santschia algeriensis*, TT. (gt), female Ht in Washington USNM, from Algeria. But epistoma is warped and as long as wide, arista short-plumose, R 5 bristled only at base; while in latter epistoma is short and in clypeal plane, arista pubescent, R 5 bristled to point far beyond R 6.

**Pachysoma nudum*, Vill. (gt).—Male Ht in Berlin, from Assuan, has propleura and prosternum bare, lateral postscutellar plates setose, middle femora bearing ctenidium of 8 spines.

*Tetradiscalis parvicauda*, End. (gt).—Male Ht in Berlin, from Europe, is **Myorhina campestris*, RD., from France. Propleura bare, prosternum bearing a few faint short setæ, lateral postscutellar plates microsetose, male middle femora with ctenidium of 4 or 5 spines.

### Tribe MILTOGRAMMINI.

*Musca tabaniformis*, Fab.—Female Ht in Copenhagen Fab. Coll., labelled "e Mogador: Schousba," has propleura and prosternum bare, no IPAL. **Craticulina tabaniformis*, Fab. (gt).

*Musca rufifrons*, Fab.—Female Ht in Copenhagen Fab. Coll., labelled "e Guinea: Krieger" and abdomen missing, is *Craticulina*, Bezzi. It differs from preceding by clypeus at least 3½ times as long as wide. Head golden, clypeus silvery-white, occiput dull silvery, thorax dull light golden. Description (Syst. Antl. 295. No. 54) states abdomen to be conic, ferruginous, cinereous-tesellate, with three black spots on median line. The species is not mentioned by Wiedemann. **Craticulina rufifrons*, Fab. (Not *Tachina rufifrons*, Wied.)

*Tachina macularis*, Wied.—Male Ht in Copenhagen, labelled "Ind: or," is near *Protomiltogramma*, TT; epistoma little longer than twice its least width, a second weaker PS in front of the posterior one, vertex 1/3 head-width, front narrowing to less than that anteriorly, no PRA, 1 PA, 1 PI, 3 LS. **Protomiltogramma macularis*, Wied. (provisionally).

*Tachina signata*, Meig.—Female Ht in Paris, from Germany, is *Amobia conica*, RD. (gt), from France, and Ht lost, in which I agree with Villeneuve. This is very evident from Desvoidy's texts. In 1830 Desvoidy had the sexes wrongly identified, but he corrected the error in 1863. In 1830 he wrongly stated that M 1 is externally convex, but in 1863 he said merely that it is arcuate. His record of parasitism in *Polistes* and *Odynerus* clinches the matter, for the *Amobia* of authors is *Macronichia*, Rdi., genotype *Miltogramma ungulans*, Pand., female Ht in Paris, which has a sharp piercer and parasitizes caterpillars. Male vertex 1/5 and female vertex 1/6 head-width, 4 PS in male and 2 in female but spaced for 4 in both, similarly 4 PI in male and 2 in female, 2 ST, 1 PRA in female and 2 or 3 in male, no PFRO but only 14 to 16 fine hairs; propleura and prosternum bare, no IPAL. The above and other characters distinguish *Amobia*, RD., from *Sarcomacronychia*, TT. *Pachyophthalmus*, BB., is a synonym of *Amobia*, RD. *Ammobia*, Bilb., does not preoccupy Desvoidy's name. **Amobia signata*, Meig. (gt).

*Miltogramma hilarella*, Zett.—Male Ht and female At in Lund, former labelled "Efper" and latter "Lundham" (both Sweden), have propleura, prosternum, and lateral postscutellar plates bare; 1 PRI (front), 2 PI, last section of C1 over 1/2 length of preceding section, M 1 and M 3 not parallel, arista long-pubescent 1/2 way in male. **Hilarella hilarella*, Zett. (gt).

*Epolia velox*, BB. (gt).—Female Ht in Wien, from Arabia, and lacking abdomen, is *Tachina elegantula*, Zett., male Ht in Copenhagen. Propleura and lateral postscutellar plates bare. **Paragusia elegantula*, Zett. (gt).

*Araba stelviana*, BB.—Male Ht and female At in Wien, from Alps, are *Arabiopsis*, TT., and close to *A. cocklei*, TT. (gt), male Ht in Washington USNM, from British Columbia. Prosternum bare, no IPAL. **Arabiopsis stelviana*, BB.

*Hoplocephalella signata*, Vill. (gt).—Male Ht in Rambouillet, from Durban, Natal (S. Africa), is evidently **Lamprometopia caffra*, Macq. (gt), female Ht from Caffraria and apparently lost. Propleura and lateral postscutellar plates bare, last section of C 1 fully 2/3 length of preceding section.

## Family **Cuterebridæ**.

### Tribe PORTSCHINSKIINI.

*Microcephalus loewii*, Schn. (gt).—Female Ht in Wien (wrongly det. male), labelled "Yakutsk: 12 Juli 1871: Jul. Kietlinski Collegit," is from Badaiba, south of the Lena River in Yakutsk Province, South-Central Siberia. The published locality of Yenisseisk is incorrect. Propleura, postalar wall, and lateral postscutellar plates bare; greater ampulla well raised, infrascutellum recessive. **Portschinskia loewii*, Schn. (gt).

**Portschinskia przewalskyi*, Port.—Ht in Leningrad not seen; male in London, from Central Asia, is *Portschinskia*, Sem. Vertex 1/5 head-width, 3rd antennal joint quite completely enclosed by 2nd, epistoma narrowed to line below, head in front view narrowed to point below, cheek-grooves deeply sunk, claws not as long as last tarsal joint, 5th sternite deeply emarginate.

*Microcephalus gigas*, Port.—Ht in Leningrad not seen; male in Wien, labelled "Amurgebiet" and "*Microcephalus* ? *gigas*: det. Brauer," is *Microcephalopsis*, TT, and agrees with the description of genotype of latter, *Microcephalus neugebaueri*, Port., from Italian Tyrol. Vertex 1/9 head-width, front narrowed to 1/10 or less just behind middle and then widening to 1/3 at base antennæ, upper terminal edge of 2nd antennal joint deeply emarginate. **Microcephalopsis gigas*, Port.

*Microcephalus bombiformis*, Port.—Ht in Leningrad not seen; male in Lima, from Amur, determined and donated by Dr. E. O.

Engel, is *Microcephalopsis*, TT, and may be *M. gigas*, Port. Propleura and tympanic ridge bare, prosternum well bristled on edges and disk, postalar wall thickly long-bristled on upper edge, greater ampulla small. **Microcephalopsis bombiformis*, Port., occurs in the mountains and high plateaux of Central Asia at around 10,000 feet.

Brauer argues that this tribe, through *Spathicera*, links the Gastrophilidæ with the Hypodermatidæ by reason of the 2nd antennal joint enclosing the 3rd in *Spathicera*, the present forms, and more or less so in the latter family. Considering, however, the wide divergence in other characters displayed by the three groups, it seems rather that the antennal specialization arose independently in each.

### Tribe CEPHENEMYIINI.

*Œstrus trompe*, Modeer.—Ht in Stockholm?, from North Europe. Propleura pilose, prosternum bare but its membrane thickly long-pilose, postalar wall thickly long-haired on upper 1/2 in middle, infrascutellum line-like; tympanic ridge and pit, RM, and IPR bare; greater ampulla moderately swollen and raised. **Cephenemyia trompe*, Modeer (gt).

### Tribe COBBOLDIINI.

*Gasterophilus elephantis*, Cobb.—Male Ht and female At in Wien, from India, have propleura bare; prosternum strongly black-bristled on disk, its membrane scarcely inflated and strongly black-bristled; postalar wall bristled on middle of upper edge, tympanic ridge and pit bare, greater ampulla not very large but very strongly raised, RM and IPR bare. **Cobboldia elephantis*, Cobb. (gt).

*Cobboldia chrysidiformis*, Rod. & Beq.—Ht in Brussels not seen; 5 other specimens known to me are: 2 in Paris, 1 in Rambouillet, 1 in London, 1 in Berlin. A deep metallic green species with orange antennæ. Greater ampulla large, well raised, globose, blackish; postalar wall pilose on upper edge; 1st sternite wide and short, 2nd longer and narrowed posteriorly, 3rd and 4th long and narrow, all free in ventral membrane and each with fringe of long pile on sides and hind edge in male; 5th sternite of male cleft deeply into double-lobed wings. **Rodhainomyia chrysidiformis*, Rod. & Beq. (gt).

### Tribe CHAULIŒSTRINI.

*Chauliœstrus capensis*, Vill. (gt).—Female Ht in Rambouillet, from Cape Colony (badly shrunk especially head), has propleura, prosternum, lateral postscutellar plates, postalar wall, tympanic ridge and pit all bare; prosternal membrane not inflated, greater ampulla not very large, infrascutellum recessive; 1st sternite large, quadrangular and overlapped by edge of tergite; 2nd sternite as long as 1st, 3rd to 8th successively shorter, all exposed, and overlapped by tergites as far as 4th; 1st hypopygial tergite showing above and strongly crescentic, 2nd showing as pair of oblique ridge-like curved structures; theca in form of a pair of flattened ovate closely-approximated tubercles, each with row of fine short setæ near inner edge. A most peculiar form, that seems to connect the Cuterebridæ with the Melanophoridæ. Two other specimens are known to me: 1 female in Stockholm, from Caffraria, collected by Wahlberg in 1838–1845 and in perfect condition; 1 female in London, from South Africa.

## Family **Hypodermatidæ**.

### Tribe ŒSTROMYIINI.

*Hypoderma satyrus*, Brauer.—Male Ht in Wien, from Central Europe, has propleura, tympanic ridge and pit bare; prosternum and its membrane black-bristled, postalar wall thinly short-pilose below upper edge and anteriorly, IPAL as strong as posterior PS, PTL a bunch of long equal bristles, RM and IPR bare. **Œstromyia satyrus*, Brauer (gt).

## Family **Melanophoridæ**.

### Tribe VILLENEUVIELLINI.

*Rhynchæstrus weissi*, Seguy (gt).—Female Ht and many female Pts in Paris, from Gafsa, Tunisia, are congeneric if not conspecific with *Villeneuviella harterti*, Aust. (gt), female Ht and male At in London, from South Algeria. Seguy's specimens are all pallid even to legs, while Austen's are deep orange-yellowish. Propleura, prosternum, lateral postscutellar plates, postalar wall, tympanic ridge and pit bare; RM ciliate on middle above, IPR bare, 1 to 2 ST. **Villeneuviella weissi*, Seguy.

### Tribe MELANOPHORINI.

*Musca maura*, Fab.—Male Ht in Copenhagen Fab. Coll., labelled "ex Tanger: Schoudton," is *Musca halterata*, Panz. No PRA, 3 PS, 2 ST. **Nyctia halterata*, Panz. (gt).

*Thereva hyalipennis*, Fall.—Male Ht in Stockholm, from Sweden, has infrascutellum line-like; propleura, prosternum, lateral postscutellar plates, postalar wall, tympanic ridge, pit, RM and IPR all bare. Length 4 mm. **Litophasia hyalipennis*, Fall. (gt). Head 1½ times as wide as high, frontal profile strongly arcuate and fully twice as long as facial.

*Ocyptera maculata*, Fall.—Female Ht and male At in Stockholm, from Sweden, are new genus published elsewhere. Not *Feburia*, RD.

*Tachina melanocephala*, Meig.—Female Ht in Paris (wrongly det. male), from Germany, has lateral postscutellar plates setose, IPAL developed; propleura, prosternum, postalar wall, tympanic ridge and pit bare. *Semitachina hylemyiæformis*, Port. (gt), male Ht in Leningrad, from West Transcaucasus, is the same species. Male has MD on intermediate segments, female normally lacking them; male front wide and PFRO present. **Phyto melanocephala*, Meig. (gt).

*Tachina lepida*, Meig.—Ht in Paris, from Germany, is *Rhinophora gagatea*, RD (gt), from France, and Ht lost. Propleura and prosternum bare, IPAL well developed. **Rhinophora lepida*, Meig. (gt).

*Dexia caminaria*, Meig.—Male Ht and female At in Paris, from Germany, are close to *Musca halterata*, Panz., but distinct. Propleura, prosternum, and postalar wall bare; 5 R at least short-petiolate. **Nyctia caminaria*, Meig.

*Tachina nitens*, Zett.—Ht not to be found in Lund. **Ptilopsina nitens*, Zett. (gt).

**Pseudophania capensis*, BB. (gt).—Male Ht and female At in Wien, from Cape of Good Hope, have propleura and prosternum bare, infrascutellum recessive, no IPAL.

**Dewetia atra*, Bisch. (gt).—Male Ht in Wien, from Algoa Bay, has infrascutellum recessive; propleura, prosternum, and lateral postscutellar plates bare.

### Tribe EOPHYTOINI.

**Acampomintho lobata*, Vill. (gt).—Male Ht in Berlin-Dahlem, from Formosa, is *Wagneriopsis formosensis*, TT. (gt), female Ht in Berlin-Dahlem, also from Formosa. Propleura and prosternum bare, IPAL barely differentiated.

### Tribe MORINIINI.

*Ocyptera umbratica*, Fall.—Ht in Stockholm, from Sweden, is *Stevenia tomentosa*, RD. (gt), from France and Ht lost. Propleura, prosternum, and lateral postscutellar plates bare; IPAL barely differentiated. **Stevenia umbratica*, Fall. (gt).

**Sepimentum fumosum*, Hutt. (gt).—Male and female Pts in London (female lacking abdomen), from New Zealand, have lateral postscutellar plates setose, postalar wall pilose; propleura, prosternum, tympanic ridge, and pit bare; no IPAL nor PTL, sternites and ventral membrane exposed in male.

*Gymnophania pernix*, Hutt.—Female Ht in London, from New Zealand, has infrascutellum recessive, frontalian striæ extremely coarse, lateral postscutellar plates pilose, propleura bare, no IPAL nor PTL. **Huttonophasia pernix*, Hutt. (gt).

**Britea tachinoides*, Curr. (gt).—Male Ht in London, from Kenya, has propleura, prosternum, postalar wall, tympanic ridge and pit bare; lateral postscutellar plates thickly set with erect setæ, infrascutellum recessive and scarcely convex, greater ampulla moderately raised, ventral membrane exposed, no IPAL, 1 moderately long, curved, but slender PTL. Close to *Paramorinia*, BB.

**Obscuria spinicosta*, Mall. (gt).—Female Ht in London, from Kenya, has propleura bare, prosternum pilose, squamopleura thickly setose, lateral postscutellar plates setose, no IPAL.

## Superfamily ŒSTROIDEA.

### Family Œstridæ.

### Tribe ŒSTRINI.

*Œstrus titillator*, Clk.—Ht?, from North Africa, is *Œstrus maculatus*, Wied., Ht in Frankfurt, from Egypt. Infrascutellum large and convex, propleura and prosternum bare, a few long hairs on prosternal membrane, postalar wall with a few bristles below upper edge, sternites and ventral membrane widely exposed, 2nd sternite large, 3rd and 4th small and as long as wide, no IPAL. **Cephalopsis titillator*, Clk. (gt).

*Cephalemyia variolosa*, Loew.—Male in Wien, labelled "Cap. b. sp. Coll. Brauer," has postalar wall long-pilose, also pleura, sternum, and base of abdomen same; lateral postscutellar plates bare, greater ampulla small, sternites and ventral membrane exposed. **Loewiœstrus variolosus*, Loew. (gt).

*Cephalemyia purpurea* Brauer.—Female in Wien, from Central Europe, has propleura bare, prosternum pilose on disk and its membrane sparsely hairy, postalar wall thinly short-bristled on middle of upper 1/2, greater ampulla not large and little raised, infrascutellum distinctly convex and three times as long (wide anteroposteriorly) as its membrane, IPAL a hair springing from tubercle like other thoracic bristles, pleura with long hair. **Rhinœstrus purpureus*, Brauer (gt).

### Tribe AULACEPHALINI.

*Trypoderma abdominalis*, Wied.—Female Ht in Wien, labelled "F," from Bengal, has propleura, prosternum, and lateral postscutellar plates bare; prosternal membrane extremely inflated, sternites widely exposed, lateral ends of tergites of intermediate segments pushed forward of middle of abdomen on median line of venter, 7th tergite (2nd hypopygial) modified into a pair of short bilaterally-moving forceps bearing dense brush of short sharp spines on inner aspect of tip, 8th sternite showing as forceps-like pair of tubercles with spines on distal aspect. **Therobia abdominalis*, Wied. (gt).

*Aulacephala braueri*, Kertz.—Female Ht in Budapest, from New Guinea, not seen; male in London, labelled "Burpengary, S. Queensland: Dr. T. L. Bancroft," has eyes contiguous, 3rd antennal joint as long as 2nd, no FRO, 4th segment longer than others, propleura bare, prosternal membrane heavily swollen. **Therobiopsis braueri*, Kertz. (gt).

**Plesiocœstrus albifacies*, Vill. (gt).—Female Ht in Tervueren Mus. Congo, from Belgian Congo, not seen; female Pt in Rambouillet, from Congo, has propleura, prosternum, lateral postscutellar plates, postalar wall bare; greater ampulla seed-like, no IPAL, RM and IPR bare, prosternal membrane greatly inflated.

**Xanthocœstrus fastuosus*, Vill. (gt).—Male Ht in Budapest, from Formosa, not seen; *X. formosus*, Vill., male in Rambouillet, from Formosa, has propleura and prosternum bare, postalar wall with few bristles at upper edge, tympanic ridge and pit bare, no IPAL.

**Xystomima maculipennis*, Vill. (gt).—Female Ht in Brussels, from Leopoldville, not seen; male At in Rambouillet, from Mt. Mlanje, and female in Rambouillet, from Durban, have propleura, prosternum, lateral postscutellar plates, postalar wall, tympanic ridge and pit bare; prosternal membrane greatly inflated in female and less so in male, no IPAL, strong PTL.

**Rondaniocœstrus apivorus*, Vill. (gt).—Male Ht in Rambouillet, from South Africa, has propleura, prosternum, lateral postscutellar plates, postalar wall, tympanic ridge and pit bare; prosternal membrane not inflated, greater ampulla prominent and raised, no IPAL, RM and IPR bare.

### Tribe ORMIINI.

**Homotrixa brevifacies*, Vill. (gt).—Male Ht in Budapest, not seen; female At in Rambouillet, from Formosa, has prosternal membrane considerably swollen; propleura, prosternum, lateral postscutellar plates, and postalar wall bare; greater ampulla moderate size, subridge-like, light coloured; no IPAL, strong PTL.

### Tribe TRIXINI.

*Crameria œstroidea*, RD. (gt).—Ht from France and lost. Propleura and prosternnm bare, postalar wall scantily pilose below upper edge anteriorly, no IPAL, PTL a bunch of long nearly equal bristles, sternites covered. **Semiomyia œstroidea*, RD. (gt). *Crameria*, RD., preoc., is synonym of *Semiomyia*, Macq.

*Trixa alpina*, Meig.—Ht?, from Alps; male in Rambouillet has propleura and lateral postscutellar plates bare, prosternum and its membrane bristled. **Murana alpina*, Meig. (gt).

**Trixa dorsalis*, Meig. (gt).—Male Ht in Paris, from Germany, has prosternum and lateral postscutellar plates bare.

*Trixa lateralis*, Wlk.—Female Ht in London, from Australia, is new genus published elsewhere. Propleura pilose.

### Tribe PALPOSTOMATINI.

*Ochromyia hyalipennis*, 1st Macq.—No Ht, but a mere renaming of **Palpostoma testacea*, RD (gt), Ht from Australia and lost. Propleura, postalar wall, tympanic ridge and pit bare; prosternum bare save 1 strong PST (rarely doubled), 1 intrapostsutural, no IPAL, 1 or 2 short PTL, ventral membrane widely exposed, each labellum with palpus-like prolongation posteriorly.

**Hamaxia incongrua*, Wlk. (gt).—Female Ht in London, from Amboyna, is *Ochromeigenia ormioides*, TT (gt), male Ht in Washington USNM, from Java. One or 2 moderate PST, 1 moderate PTL, no IPAL, labella with palpus-like prolongations, lateral ends of 3rd and 4th tergites drawn forward to midventer in female, sternites exposed in female and ventral membrane in male.

**Afromeigenia pallens*, Curr. (gt).—Male Ht and female At in Pretoria Munro Coll., from South Africa, not seen; male Pt in New York, from Natal, has 1 strong PST, lateral postscutellar plates bare as in *Hamaxia*, Wlk., labella with minute palpus-like prolongations, M 3 strongly approximated to R 6.

### Tribe PARATRIXINI.

**Paratrixa polonica*, BB. (gt).—Male Ht in Wien, from Poland, has propleura and prosternum bare, prosternal membrane somewhat inflated, strong IPAL, 2nd to 4th sternites covered.

### Tribe GLAUROCARINI.

**Glaurocara flava*, Thom. (gt).—Female Ht in Stockholm, from Mauritius, has propleura, prosternum, lateral postscutellar plates, postalar wall, tympanic ridge and pit all bare; prosternal membrane not inflated, ventral membrane not exposed, but sternites uncovered.

*Tachina mellea*, Wied.—Female Ht and male At in Copenhagen Westermann Coll., labelled "Batavia, Java (August, 1815)," also male in Westermann Coll., labelled "Pulo, Penang," and female in Berlin-Dahlem, labelled "Java occ: Preanger," are all apparently the same species as *Doddiana pallens*, Curr. (gt), male Ht in New York, from Queensland, and *Semisuturia australis*, Mall. (gt), female Ht in Washington Malloch Coll., from New South Wales. It is a question whether the seven additional species described by Malloch under *Semisuturia* from the Oriental Region are distinct from *mellea*, which appears to be an old and variable species extending from Malaysian mainland to Australia. The Australian specimens have the frontalia somewhat wider, and there are slight differences in the thoracic chætotaxy and venation of Malayan specimens, which seem to be the only structural variations. The antennæ are darker in Australian specimens, and even the thorax and abdomen as well as antennæ are darkened in some Malayan specimens. Malloch states that he has found a male, which he accepts as *australis*, with PFRO; even so, males at times show female tertiary sexual characters by sport, and much more material is needed to demonstrate the distinctness of *australis*, the more so since *pallens* male shows no PFRO. **Doddiana mellea*, Wied. (gt). The genus is very close to *Œstrocharis*, Vill.

**Œstrocharis lutescens*, Vill. (gt).—Male Ht in Rambouillet, from Cape Colony, male in Berlin, labelled "Togo. Bismarckburg. Oct 1891. R Büttner S," and female in London, from Sierra Leone, have propleura, prosternum, lateral postscutellar plates, postalar wall, tympanic ridge and pit all bare, as in *Doddiana*, Curr.; 1 MM on 1st segment in Berlin male and London female but none in male Ht, 4 strong LS in Berlin male but only 3 in the other two specimens, IPAL small.

### Tribe MYIOTRIXINI.

**Myiotrixa prosopina*, BB. (gt).—Male Ht in Wien, labelled "Thorey: 1864: Austral. sept.," has propleura and prosternum bare, prosternal membrane not inflated, ventral membrane widely exposed, epistoma over twice as long as clypeus and in clypeal plane throughout, V not differentiated, abdomen flattened and nearly circular in outline from above, no abdominal macrochætæ.

## Family Phasiidæ.

### Tribe PHASIINI.

*Neophasia picta*, BB. (gt).—Female Ht in Wien, labelled "Thorey: 1864: Austral. occid.," and male in London, from New South Wales (E. Daniel), have propleura and lateral postscutellar plates bare, male vertex 1/4 head-width and female less, 2 long PFRO in both sexes and 2 short ones between them, 2 PS in male and 3 in female, epistoma nearly as long as clypeus. **Euphasia picta*, BB. (gt). *Neophasia*, BB., preoc., is synonym of *Euphasia*, TT.

*Musca helluo*, Fab.—Ht not seen. Differs from *Musca continua*, Panz., practically only in the slightly stronger macrochætæ and wider facial plate, and should be considered congeneric with latter. *Chryseria gentilis*, RD. (gt), from France, is the same species. Propleura and prosternum bare, no IPAL nor PTL. **Clytiomya helluo*, Fab. *Chryseria*, RD., is synonym of *Clytiomya*, Rdi.

*Xysta semicana*, Egg.—Male Ht in Berlin, labelled "*Xysta semicana*, Schiner," "10912." "21/9 Rl," and small square rose-coloured tag (equals Coll. Loew), has propleura and prosternum bare, lateral postscutellar plates setose, epistoma longer than clypeus and as wide as parafacial plus facial, eyes not contiguous, 2 or 3 FRS below base antennæ, parafacialia nearly as wide as clypeus, 1 ST, 5 R closed in wing-tip, abdominal macrochætæ hair-like, whole body set with erect, short, moderately thick pile. **Euxysta semicana*, Egg. (gt).

*Tetrapteromyia klossi*, Mall. (gt).—Male Ht in London, from Malay Peninsula, not seen; from description the species is *Compsoptesis*, Vill., and close to *C. phœnix*, Vill. (gt), male Ht in Rambouillet, from Formosa. **Compsoptesis klossi*, Mall.

## Tribe TRICHIOPODINI.

*Musca fasciata*, Fab.—Male Ht in Copenhagen Fab. Coll., labelled "ex Guinea: Thonning," is *Bogosiella pomeroyi*, Vill. (gt), Ht and many Pts in London, from South Nigeria. There are also two males and one female in Copenhagen Westermann Coll., from Guinea. Propleura, prosternum, lateral postscutellar plates, post-alar wall, tympanic ridge and pit bare; no IPAL, very weak short PTL, ventral membrane exposed. **Bogosiella fasciata*, Fab. (gt).

*Phasia helva*, Wied.—Male Ht in Wien, from Cape of Good Hope, shows the characters given under preceding. **Epineura helva*, Wied. (gt).

**Saralba ocypteroides*, Wlk. (gt).—Male Ht in London, from New Guinea, has the head, the single wing, and the abdomen all glued on. The abdomen might be Cylindromyiine, the head Phasiine, and the wing Trichiopodine; yet, despite the doubt arising from the glued conditions, I believe the parts are correctly assembled. Propleura, prosternum, and lateral postscutellar plates bare; head little wider than thorax; epistoma gently nasute, fully 1/3 as long as wide, and nearly twice width of parafacial plus facial; frontalia equibroad and six times width of parafrontal; parafacialia bare, equibroad, and 1/2 width of facialia; no PRA, 2 ST, 5 R neck-petiolate, R 5 bristled at base, M 3 sinuate and its length from CB; abdomen subcylindric, subcompressed basally, 1st segment and base of 2nd equibroad and much narrower than rest of abdomen, 1 MM barely differentiated on 1st segment, 1 MM on 2nd and MR on last two segments; hypopygium ventral, its base showing above as short 5th segment; 5th sternite neither cleft nor emarginate, sternites exposed and ventral membrane narrowly showing on one side, claws all broken but apparently elongate originally.

*Bogosia engeli*, Karsch.—Female Ht in Berlin, from West Tanganyika, is new genus published elsewhere. Lateral postscutellar plates setose, 1 PTL.

*Bogosia engeli*, Vill. (nec Karsch).—Male in Rambouillet, from Madagascar, is *Bogosia*, Rdi., and evidently not more than a variety of *B. antinorii*, Rdi. (gt), Ht in Genoa?, from Abyssinia, not seen. Propleura, prosternum, lateral postscutellar plates, and postalar wall all bare; no IPAL nor PTL, no OCS, squamæ not as wide as long. **Bogosia antinorii*, Rdi. (gt).

### Tribe CYLINDROMYIINI.

*Ocyptera atrata*, Fab.—Male Ht in Copenhagen Fab. Coll., labelled "e Guinea: Krieger," is new genus published elsewhere.

*Ocyptera diabolus*, Wied.—Male Ht and male Pt in Copenhagen Westermann Coll., labelled "Cape Good Hope: Jan. 1817," are *Hermya afra*, RD. (gt), male Ht lost and wrongly recorded Brazil. *Hermya hottentota*, RD., female Ht from Cape of Good Hope and lost, is same species. Male has gold face and female silver face. *Paraphania*, BB., is synonym of *Hermya*, RD. Propleura, prosternum, and lateral postscutellar plates bare; no PTL. **Hermya diabolus*, Wied. (gt).

*Tachina beelzebul*, Wied.—Male Ht in Leyden (wrongly det. female), from Java, is evidently *Orectocera micans*, Wlp. (gt), female Ht in Leyden?, from Sumatra. Neither Ht seen by me. **Orectocera beelzebul*, Wied. (gt).

*Ocyptera bicolor*, Wied.—Male Ht and male Pt in Copenhagen, labelled "ex Ind: or.," are *Ecatocyptera evibrissata*, TT. (gt), female Ht in Berlin-Dahlem, from Formosa. Propleura, prosternum, lateral postscutellar plates, postalar wall, tympanic ridge and pit all bare. **Plesiocyptera bicolor*, Wied. (gt).

*Ocyptera fuscipennis*, Wied.—Ht in Copenhagen Westermann Coll., from Java, not seen; female Pt in Wien, labelled "Java: Coll. Winthem," is *Opsocyptera*, TT., and differs from *O. optima*, TT. (gt), female Ht in Lima, from Mindanao, only by having black frontalia and silvery-white parafrontalia and thoracic dorsum. Same characters as given under preceding. **Opsocyptera fuscipennis*, Wied.

*Tachina imbuta*, Wied.—Male Ht and female At in Copenhagen, labelled "ex Ind: or.," have same characters as given under preceding two, no IPAL nor PTL. **Paralophosia imbuta*, Wied. (gt).

*Duvaucelia bicincta*, RD. (gt).—Female Ht in Paris (wrongly det. male), from Bengal, has propleura and lateral postscutellar plates bare, no PTL, 1 PFRO and 1 RFRO, 2nd antennal joint elongate and 3rd nearly three times 2nd. **Curtocera bicincta*, RD. (gt). *Duvaucelia*, RD., preoc., is synonym.

*Trichoprosopa marginalis*, Wlk.—Ht in London, from Amboyna, has front, proboscis, and palpi eaten out, and, further, lacks abdomen, so that sex cannot be verified. Propleura also largely eaten out but apparently bare, lateral postscutellar plates bare, strong IPAL, 3 PS, vertex not 1/3 head-width, 3rd antennal joint 2½ times 2nd, cheeks nearly 1/4 eye-length, R 5 bristled halfway to R 6. Probably female. Close to *Orectocera*, Wlp. **Gerocyptera marginalis*, Wlk. (gt).

**Zambesa ocypteroides*, Wlk. (gt).—Male Ht in London, from Singapore, measures 11 mm. and shows same characters as given under *Tachina imbuta*, Wied. Petiole of 5 R as long as R 6, 2 PFRO crowded nearly into FRS and set far back, abdomen nearly equibroad, 3rd segment conspicuously shortened ventrally, 4th segment same length dorsally as 3rd, basal segment (1st actual) showing well from above and deeply arcuately emarginate on base; genitosternite with two wide leaf-like lobes each pointed at tip, median part of the sternite produced in pair of rounded processes; claws very elongate.

*Tachina melanura*, Meig.—Female Ht in Paris, from Germany, is *Ocyptera lateralis*, Fall., Ht in Stockholm, from Sweden. *Besseria reflexa*, RD., Ht from France and lost, is same species. Propleura and prosternum bare, no IPAL nor PTL. **Besseria lateralis*, Fall. (gt).

**Lophosia fasciata*, Meig. (gt).—Male Ht in Paris, from Germany, is badly developed and much eaten, but is evidently the species currently accepted as this. No ST or only a weak hair-like one, 2nd aristal joint elongate.

**Macrolophosia felderi*, BB. (gt).—Female Ht in Wien, labelled "Felder: O. Indien" (wrongly det. male), has 2nd segment ventrally extended posteriorly to near hind margin of 3rd much as in *Stylogynemyia*, TT., but differs from latter in having MR of 16 heavy close-set macrochætæ on 4th segment, 2 ST, strong FRO, vertex 1/6 head-width, and front and face well widened therefrom.

**Pseudocyptera obscura*, BB. (gt).—Male Ht in Wien (wrongly det. female), labelled "Felder: O. Indien," is close to preceding, but has 3 strong ST, 1 short erect MM on first two segments and MR of short erect on last two, vertex 2/7 head-width, and front nearly 2/5 same anteriorly.

**Clara dimidiata*, BB. (gt).—Male Ht in Wien, from Cape of Good Hope, has propleura and prosternum bare.

**Conopisoma miraculum*, Spsr. (gt).—Female Ht in Stockholm (wrongly det. male), from Kilimandjaro, has stout needle-like piercer and a tuft of bright fulvous hair above its base; propleura, prosternum, and lateral postscutellar plates bare; 3 PFRO and 2 RFRO, front one of latter small.

**Liancosmia ditissima*, Spsr. (gt).—Female Ht in Stockholm (wrongly det. male), from Kilimandjaro, has 3rd antennal joint seven times 2nd, vertex 1/5 head-width, MR on last two segments; prosternum, propleura, and lateral postscutellar plates bare.

**Xenolophosia hamulata*, Vill. (gt).—Male Ht in Berlin-Dahlem, from Formosa, is *Formosolophosia hemydoides*, TT. (gt), male Ht same origin and location. Propleura, prosternum, and lateral postscutellar plates bare; no IPAL nor PTL.

*Xenolophosia diversipes*, Vill.—Female Ht in Berlin-Dahlem, from Formosa, is **Perilophosia ocypterina*, Vill. (gt), male Ht same origin and location. Same characters as given under preceding.

### Tribe EUTHERINI.

*Euthera mannii*, Mik.—Female Ht and male At in Wien, labelled "Mann : 1863 : Brussa," have propleura, prosternum, and lateral postscutellar plates bare; no IPAL nor PTL. **Eutheropsis mannii*, Mik. (gt).

[To be continued.]

## L.—*Californian Hydrocorals.* By W. K. FISHER, *Hopkins Marine Station of Stanford University, California.*

[Plates XV.-XVII.]

Two species of Stylasterina have long been known from Californian waters, *Allopora californica*, Verrill, and *Errina pourtalesii*, Dall, although very little has been written about them. To these may now be added *Allopora venusta*, Verrill, and a very distinct new species, for which a new generic division, *Stylantheca*, has been instituted. Dall's species does not belong to *Errina*, but to *Errinopora*, a new genus.

I have examined the types of the Californian species, and also of three Alaskan forms described by W. H. Dall *—*Allopora verrillii*, *A. moseleyi*, and *A. papillosa*. The types are very meagre fragments of thin encrusting colonies, pink in colour. Their cyclosystems in general resemble those of *A. californica*. *A. verrillii* and *A. moseleyi* have a funnel-shaped cup with the deep dactyloporic slits of *californica* (seven to nine); while *papillosa* has smaller cyclosystems and rather fewer and shallower slits. The tiny colony on a fragment of mussel-shell has a very papillose "sugary" surface. More material is required in order to determine the status of these forms. I think they are distinct from the Californian species.

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* "On some Hydrocorallinæ from Alaska and California," Proc. Biological Soc. Washington, vol. ii., April 28, 1884, pp. 111-115:—*A. verrillii*, no. 4193, U.S. National Museum, Chika Islands, Akutan Pass, near Unalaska, Aleutian Islands; *A. moseleyi*, no. 6851, U.S.N.M., Kyska Harbour, Kyska Island, western Aleutians; *A. papillosa*, no. 6552, U.S.N.M., Unga, Shumagin Islands.

For the donation of specimens I am greatly indebted to the authorities of the following institutions: the U.S. National Museum, the Peabody Museum, Yale University, the Museum of Comparative Zoölogy.

The drawings are by the writer; the photographs are by Prof. G. E. MacGinitie.

### *Allopora californica,* Verrill. (Pl. XV. figs. 3, 3 *a*, 3 *b*.)

*Allopora californica,* Verrill, Proc. Essex Inst. vol. iii. 1866, p. 37; "Notes on Radiata in the Museum of Yale College.—No. 6. Review of the Corals and Polyps of the West Coast of America," Trans. Conn. Acad. Arts & Sciences, vol. i. 1868, p. 516, pl. x. fig. 8.

The type-colony is about 140 mm. high by 125 mm. broad; one from Monterey Bay, California, is 160 mm. high by about 190 mm. broad, and 60 to 80 mm. thick. The corallum rises into thick, irregularly-lobed, or palmate branches, the trunk of the colony being massive, sometimes subflabelliform, so that the whole colony tends, with age, to assume a rather flabellate contour, as the difference in breadth and thickness would indicate. This is not invariably the case, but probably represents the growth-tendency in favourable situations. The branches usually divide dichotomously but irregularly, in some instances as many as five times. Occasionally branches coalesce. The ends are usually slightly tapered, rounded.

The cyclosystems are very numerous, 0·6 to 1 mm. in diameter, characteristically deep, funnel- rather than cup-shaped, with six or seven (ordinarily four to eight) *unequal*, deep, dactylopore indentations of the margin. This margin is raised slightly above the general cœnosteal surface, which, when dry, has a minutely sugary texture, and is often provided with low papilliform prominences (Pl. XV. fig. 3 *a*). In addition, there is a variable number of papilliform pores (fig. 3), raised orifices of canals which descend into the cœnosteum, often in the wall between ampullæ. In some cases there may be four or five ampullæ around a cyclosystem. The papilliform prominences are rather scarce in the largest specimen, but very numerous in a large fragment of another colony, in which the papilliform pores are lacking.

In *A. californica* the gastrostyle is really smaller and slenderer than in *A. venusta,* but, when viewed from above, appears to be larger. A section of the cyclosystem shows that only a part of the gastrostyle of *venusta* can be seen from above, while in *californica* the entire width is exposed. In both species the style resembles a miniature brush with minute sharp bristles.

Colour of dried colony coral red (Ridgway's nomenclature).

*Type.*—No. 447, Peabody Museum, Yale University.

*Type-locality.*—" California."

I have examined the type-colony, of which a fragment was kindly donated for direct comparison with my material from Monterey Bay. Verrill states that the type was collected by Major William Rich during the war between Mexico and the United States, and may have come from deep water in the Gulf of California. The Monterey Bay examples are typical, and were taken in about 25 fathoms.

The papillation of the cœnosteal surface between the cyclosystems, as well as the small papilliform orifices mentioned above, do not afford reliable specific characters unless a fair-sized fragment is examined. Some portions of the colony may lack either or both of the characters, the surface between the cyclosystems being smooth.

### *Allopora venusta,* Verrill. (Pl. XV. figs. 2, 2*a*.)

*Allopora venusta* Verrill, Trans. Conn. Acad. Arts & Sciences, vol. i. 1868, p. 517, pl. x. fig. 9.

All the specimens of this species which I have examined are much smaller than those of *californica.* The colony is more arborescent. The type-colony is 25 mm. high by 50 mm. broad, its expanded base attached to a water-worn stone. It rises in stout lobes or branches; some of the branches are broad and somewhat palmate or digitate; the terminal branchlets are mostly round, about 3 or 4 mm. thick, with obtusely rounded tips. Several small colonies from off Cape Flattery, Washington, are about 35 mm. high by 40 mm. broad, with few dichotomous branches. The Monterey colony is 70 mm. high by 70 mm. broad, and about 30 mm. thick.

The cyclosystems are subcircular, with a low, abruptly raised border, and five to eight, usually six or seven, shallow, subequal, dactylopore indentations, much smaller and more nearly equal than those of *californica*. The central cup is shallower and of a different form (Pl. XV. fig. 2 *a*). These differences are not brought out by Verrill's diminutive figures. Viewed from above, the gastrostyle tip is seen through a subcircular aperture of the bottom of the cup. The border of this aperture is a ridge composed of ornate, lobate rugosities, somewhat more prominent than the fenestrated rugose skeleton of the cup itself, and only clearly apparent in specimens cleaned with sodium hypochlorite solution. The entire breadth of the minutely hirsute style is not apparent from above. Diameter of cyclosystems, 0·5 to 0·8 mm.

A pale violet forma from Cape Flattery, 40 fathoms, has usually appreciably deeper cups than the type forma. The marginal dactylopores are typical.

A southern forma (Farallone Islands and Monterey Bay, rose pink in colour) also has slightly deeper cups. The Monterey Bay example, in addition, has an unusually small aperture in the bottom of the cup, so that the subacute end of the gastrostyle (which is somewhat slenderer than in the type form) is less exposed than in northern specimens.

In *venusta* the surface of the cleaned cœnosteum is smooth, not minutely pitted or fenestrated, yet, owing to the underlying structure, under strong magnification it reminds one of pink sugar. The little pustules are sparse, of uncertain occurrence, and the intercalycine apertures are scarce, tiny, and without a raised border (which is not always present in *californica*).

There are two colour-phases, the prevalent being pink (a dull "rose colour" of Ridgway's nomenclature). A faded violet form occurs off Cape Flattery, but has not been found in California.

*Type.*—In Museum of Comparative Zoölogy (examined).

*Type-locality.*—Neah Bay, near Cape Flattery, Washington.

*Specimens examined.*—Off Cape Flattery (near type-locality), 27 to 40 fathoms, rocky bottom; 4 colonies.

Farallone Islands, California (37° 47′ 30″ N.; 123° 10′ 40″ W.), 29 fathoms, rocky bottom; one colony.

Monterey Bay, California, 30 fathoms; one colony.

### STYLANTHECA, gen. nov.

Resembles *Allopora*, but a cyclosystem may contain upward of seven gastrozooids, each with its own gastrostyle; a variable number of cyclosystems with one gastrozooid only; gastrozooid tentacles 5 to 8, short; dactylozooids as in *Allopora*, provided with a well-developed spiculate style.

Type, *Stylantheca porphyra*.

### *Stylantheca porphyra*, sp. n. (Pl. XV. figs. 1, 1*a*; Pl. XVI. figs. 5, 5*a*–5*b*; Pl. XVII. figs. 6, 6*a*–6*c*.)

Colony encrusting, thin, reddish purple, with rather large circular or elliptical cyclosystems having usually eight to ten subequal dactylopores; gastropores with from one to seven gastrostyles, variable in size; cœnosteum firm, with numerous small papilliform prominences, occasionally arranged in subparallel rows.

The cyclosystems, which are subcircular to elliptical, and relatively large, have a low raised border indented by usually eight to ten dactylopores, whose radial extent is equal to from one-fourth to one-third the diameter of the gastropore alone; rounded bottom of gastropore a little broader than the top. On the side of the cup the dactylopore-slits extend about 0·6 to 0·7 the distance to bottom. Diameter of cyclosystems 1·0 to 1·75 mm., usually 1·25 to 1·5 mm.; depth about equal to extreme width. Occasionally two cups coalesce, but the ordinary elliptical cups are not formed by a union of two. One of the most characteristic features of this species is the presence of from two to five gastrostyles in both circular and elliptical cyclosystems, three and four being a common number; exceptionally six or seven. In the type-colony cups with single gastrostyles are much less numerous than those with several. In another colony cups with one are slightly in the majority. The styles differ greatly in size; in form vary from subglobose to elongate-acorn shape, and are beset with delicate, often pronged spicules. The interior of the cup is of a minutely fenestrated spongy structure, which closely encircles the style and often partly obscures it.

In aquaria the zooids expand rather readily. Their form and posture in the cyclosystem is best indicated by the figures (Pl. XVI. figs. 5 *a*–5 *b*). The gastrozooid has an elongate ovoid form, the hypostome representing the broader end. The tentacles are small, blunt, five to eight, commonly six, and are inserted at about mid-height. I have one small fragment with expanded gastrozooids on which I can find no definite tentacles. In many other fragments examined the zooids all have tentacles characteristically short with rounded tips. At the bottom of the gastrozooids the style is plainly visible whenever the mouth is widely expanded. When the gastrozooid retracts, it retires below the bottom of the cup to the slight space immediately surrounding the style.

The surface of the cœnosteum is firm, sugary in texture under high magnification, and is unevenly beset with small pustules somewhat less in diameter than a dactylopore. These pustules vary in spacing, and areas exist entirely free from them. They are sometimes arranged in subparallel rows. The ampullæ do not form rounded or blister-like prominences, yet may be closely packed between the cyclosystems, each cell about one-third to one-half the width of a cyclosystem. If the cœnosteum is thick enough the ampullæ are higher than broad, and in section remind one of a miniature purplish honeycomb. The dorsal wall is stout.

Colour in life, under water, varies somewhat, but may be described as reddish purple (pansy violet, dull magenta purple, light Rood's violet of Ridgway's nomenclature). In alcohol it changes very little. A dried colony appears faded, but on being soaked in water very nearly resumes the life-colour. The colour survives long immersion of colony in sodium hypochlorite solution. A fragment decalcified in hydrochloric acid becomes pale yellowish (faded "sponge colour").

*Type.*—In U.S. National Museum; paratype will be deposited in British Museum (Natural History).

*Type-locality.*—Pescadero Point, Carmel Bay, California (36° 33′ 30″ N.); exposed in grotto, at lowest tides.

This species has been found only at lowest tide on the exposed coast from Monterey Bay to a few miles south of Carmel Bay. The type-colony, along with several others, lives in a small grotto-like cavity, through which there is free circulation of water. Here they form lichen-like splashes of ruddy purple in contrast to white, scarlet, and yellow sponges, orange and bronze hydroids and bryozoans, brown tunicates.

In 1919 the type-colony alone lived in this grotto. Then it measured about 50 mm. in diameter; now it measures 300 by 250 mm. From time to time sponges and tunicates which encroached upon it have been removed.

It seems probable that the real home of the species is in the dimly-lighted region below lowest tide, as its occurrence in the intertidal zone is rather sporadic. Conditions at the type-locality favour the upward migration of subtidal species.

### ERRINOPORA, gen. nov.

Resembles *Errina* (including *Labiopora*) in having a prominent gouge-shaped projecting lip to each major dactylopore, but differs in the presence of a well-developed spiculate *dactylostyle*; no differentiated cup-like cyclosystem, although where the pores are not crowded several dactylopores encircle a gastrostyle; tip of gastrostyle flush with surface or sunken in an undifferentiated depression; fewer scattered tiny dactylopores without projecting lip; cœnosteum reticulate superficially, compact centrally. The channel of the dactylostyle is not definitely oriented either toward the end of the branch or in the opposite direction, as in most species of *Errina*.

Type, *Errina pourtalesii*, Dall.

### *Errinopora pourtalesii* (Dall.).
### (Pl. XVI. figs. 4, 4 *a*, 4 *b*; Pl. XVII. figs. 7, 7 *a*.)

*Errina pourtalesii*, W. H. Dall, "On some Hydrocorallinæ from Alaska and California," Proc. Biol. Soc. Washington, vol. ii., April 28, 1884, p. 114.

A nearly perfect colony was brought up on rock-cod lines off Point Sur (25 miles south of Monterey Bay), California, from a depth of between 50 and 90 fathoms. It rests on an irregular, deeply fenestrated base of dead hydrocoral thickly encrusted with sponges, bryozoans, serpulid tubes, barnacles, brachiopods, and solitary corals (*Paracyathus*). The horizontal dimensions of the living portion are 265 mm. by 130 mm.; total height, 180 mm.; the living portion, 100 mm. There are very many subterete, round-tipped, one to four times dichotomously-branched prongs arising from the very irregular, fenestrated, encrusting base which, as above stated, rests on "dead" calcareous foundation. The main branches are 10 to 12 mm. in diameter; the terminal branchlets 4 to 6 mm. Two small colonies from off the Farallone Islands, California, have only a few branches, and measure, respectively, 75 and 35 mm. in height.

The branches are rough from very numerous scoop-shaped projections, outgrowths of the margin of the larger dactylopores. The hollow of the scoop is oriented in every direction around a circle, and along its bottom is a slight ridge carrying a cheval-de-frise of tiny spicules—the dactylostyle. Irregularly in depressions among the projections are the ovoid hirsute gastrostyles. Here and there are tiny secondary dactylopores without projecting lip, or with only a rudimentary one. In the latter a very tiny style can be detected. In the large colony much of the space between the major dactylopores is occupied by ampullæ, the covering of which is a very delicate irregular reticulum. This roof, which may show slight swellings, indicating individual ampullæ, is superficially a lighter pink than the projecting dactylopores. An irregular aperture is present in the roof of most of the ampullæ.

On the basal part of the colony where there is no crowding (Pl. XVI. fig. 4 *b*) one can find numerous primitive cyclosystems composed of a central gastrostyle with from two to five associated projecting dactylopores oriented so that the slit and its style face toward the gastrostyle, the top of which may be in the bottom of a very shallow depression or else nearly flush with the general surface of the cœnosteum. As an examination of the figures will show, this is a more generalized condition than in *Allopora*, where the dactylopores are coordinated with the gastropore to form a circumscribed cup. The simpler arrangement suggests an ancestral stage of both genera.

When the cœnosteum is not "bubbled up" by ampullæ the surface is firm and smooth; under high magnification of a sugary texture, as in *Allopora.*

Colour of dried colony pink, varying from near eosine pink to rose pink of Ridgway's nomenclature. One small specimen is jasper pink.

*Type.*—In the U.S. National Museum and Museum of Comparative Zoölogy. "A large stone with several specimens upon it was obtained by Count Pourtalès in 1873, and is now in the Museum of Comparative Zoölogy." A small fragment of this, now in the U.S. National Museum, was used as the type (examined).

*Type-locality.*—50 to 100 fathoms about the Farallone Islands, California.

*Specimens examined.*—Off Farallone Islands, 27 fathoms, 2 specimens.

Point Sur, California, 50 to 90 fathoms, rock-cod fishermen. Large colony, gift of Dr. G. Van Wagenen.

## EXPLANATION OF THE PLATES.

### PLATE XV.

*Fig.* 1. *Stylantheca porphyra.* A typical cyclosystem with four gastrostyles, viewed directly from above. × 30.

*Fig.* 1 *a.* Same. A section of a cyclosystem showing two gastrostyles and four dactylostyles. The dotted line crossing the gastrostyles indicates the bottom of the cup; the lower, dash, line is the bottom of the colony, which was here very thin. On the right an entire dactylopore is shown in section. × 30.

*Fig.* 2. *Allopora venusta.* A cyclosystem from above; specimen from off Cape Flattery. × 30.

*Fig.* 2 *a.* Same. Section of a cyclosystem for comparison with 3 *b.* × 30.

*Fig.* 3. *Allopora californica.* Three cyclosystems of a specimen from Monterey Bay. × 30.

*Fig.* 3 *a.* Same. A cyclosystem of the type. × 30.

*Fig.* 3 *b.* Same. Section of a cyclosystem. On either side are portions of ampullæ; specimen from Monterey Bay. × 30.

### PLATE XVI.

*Fig.* 4. *Errinopora pourtalesii.* Tip of a branchlet of specimen from Point Sur, California, showing the lipped dactylopores, dactylostyles, and scattered circular gastrostyles; small black spots are secondary dactylopores. × 15.

*Fig.* 4 *a.* Same. Above are two dactylopores, one showing style; below, two gastrostyles; *a, a,* ampullæ, the thin wall of which has been removed. × 30.

*Fig.* 4 *b.* Same. Farallone Islands specimen. Two gastropores and gastrostyles with associated primary and secondary dactylopores, from a portion of stem where the elements are not crowded. There may be upward of five primary dactylopores surrounding a gastrostyle. × 30.

*Fig.* 5. *Stylantheca porphyra.* A small cyclosystem with three large gastrostyles, the upper two confluent. × 30.

*Fig.* 5 *a.* Same. A cyclosystem drawn from life, showing a partly-expanded gastrozooid, with eight tentacles, and dactylozooids. × 30.

*Fig.* 5 *b.* Same. A cyclosystem drawn from life, showing four gastrozooids, with five and six tentacles. Encircling them are the mostly retracted dactylozooids. × 30.

### PLATE XVII.

*Fig.* 6, 6 *a*–6 *c.* *Stylantheca porphyra.* Fragments from the type-locality. Fig. 6 shows the papilliform prominences of cœnosteum arranged in lines, × 3. *a,* aperture of annelid tube; *d,* double cyclosystems.

*Fig.* 7, 7 *a.* *Errinopora pourtalesii.* Small colony from type-locality, × 3. Fig. 7 shows the base and 7 *a* the distal part of the same branch. In fig. 7 may be seen the primitive cyclosystems referred to in text.

## LI.—*Some African Bees.* By T. D. A. Cockerell.

The bees discussed below were received from Sir Guy Marshall, Imperial Institute of Entomology, and are all in the British Museum.

### *Systropha ugandensis*, sp. n.

♂.—Length about 9·5 mm. (with abdomen curved as usual), anterior wing 7·5 mm.

Shining black, flagellum obscure brown beneath, tegulæ reddish brown with rather pale margins, wings dilute brownish, nervures and margin of stigma brown; hair of head and thorax rather abundant, erect, pale mouse-grey; legs with pale hair, but blackish on outer side of hind tibiæ. A broad shining basin at each side of vertex; mesothorax shining, with minute feeble punctures; scutellum with a median sulcus; area of metathorax dull, but with a thick shining rim; basal nervure meeting nervulus; second cubital cell receiving recurrent nervure a short distance beyond middle; abdominal sternites not much modified, the second and third each with a low transverse ridge, interrupted in middle, and fourth with a pair of widely separated transverse elevations; apical tergite truncate at end and with a strong tooth at each side, but below this (seventh sternite) is an elongated thick process, not broadened or angulate at sides (as it is in *S. krigei*, Brauns). In the comparatively simple sternites this resembles *S. tropicalis*, Ckll., from Ceylon, but it is a considerably larger insect, with much longer third cubital cell, dull base of metathorax, and many other differences. Strand described a female from Zanzibar as *S. macronasuta* (since erroneously cited by Friese as *S. macrognatha*), but it is 12 mm. long, with brownish legs, and can hardly be the female of the present insect.

Uganda: Kampala, Nov. 17, 1915 (*C. C. Gowdey*).

When Friese published his great work on African bees in 1909 not a single *Systropha* was known from the Ethiopian region. In 1911 Friese described one (quite distinct from *S. ugandensis* by the abdominal structures and the colour of the pubescence) from British E. Africa, and Strand one from Zanzibar. In 1914 Friese described one from Cameroon (W. Africa), and in 1922 three from Rhodesia. In 1926 Brauns published one from the Transvaal. Others will doubtless be found by those who will look for them in convolvulus flowers.

### *Rediviva neliana*, sp. n.

♂.—Length about 11 mm., anterior wing 10·3 mm.

Black, including mandibles, but the long flagellum obscurely reddish beneath except at base, the densely hairy tegulæ light red with dark base, the very hairy slender middle basitarsi pale dull red, the robust hind tibiæ light red suffused with dusky about the middle, the broad hind basitarsi and most of next joint light red; hair of head and thorax long and abundant, on face dense and white, forming a copious beard, wholly concealing the surface; hair on cheeks white, on vertex black, on occiput pale fulvous; hair of thorax above pale fox-red, brightest and longest on scutellum, on pleura and metathorax white; legs with mostly white hair, yellowish on tarsi and hind tibiæ, really pale orange on hind legs beyond femora, but brown at ends of tarsal joints; first two tergites with long, pale, slightly fulvous hair, discs of following tergites with short inconspicuous black hair; all the tergites with copious apical hair-bands, on first pale fulvous, on second and third white overlapped with pale fulvous, on fourth and fifth white, on sixth pale fulvous; head ordinary, about as wide as thorax; malar space short but distinct; mandibles bidentate; tongue short, with long hair, the base moderately broad, the apical half very slender; maxillary blades short and broad, shining black; labial palpi four-jointed, black, the first joint much longer than the others, which are more or less white at base, the third broadly so; maxillary palpi long and slender, black, six-jointed, the first joint short and stout, the second longest; third antennal joint longer than fourth, but not nearly as long as next two combined; flagellum long and thick, subtruncate apically; vertex flattened on each side of ocelli, shining; occipital margin raised; mesothorax and scutellum finely punctured, moderately shining, the scutellum almost hidden by dense hair; metathorax very hairy, the basal area small, polished, hardly defined. Wings greyish hyaline, the outer margin more dusky; stigma very slender, sharply pointed, rufous with a dark margin; nervures dark fuscous; basal nervure gently arched, meeting nervulus; second cubital cell broad, much broadened below, receiving recurrent nervure well beyond middle; third cubital cell long, but not as long as first, receiving second recurrent nervure well beyond middle; hind wing with twelve hooks; claws deeply bifid. Abdomen shining; apical plate elongate, parallel-sided, truncate, clear red at end, the apical portion shining, the rest dull; sixth sternite strongly emarginate.

Cape Province: Lady Grey, Feb. 2, 1924 (*R. I. Nel*).

This bee has entirely the aspect of *Dasypoda*, but has three cubital cells. The maxillary blade is very much shorter than in *Dasypoda* and the antennæ are much longer. The marginal cell is more elongated, with the apical part more slender. However, this comparison was made with *D. argentata*, Panzer, and I observe that *D. sinuata*, Pérez, has the antennæ and marginal cell much more like that of *R. neliana*. It seems evident that this must go in *Rediviva*, Friese, 1911, proposed as a subgenus of *Andrena*, type *R. peringueyi* (Friese), from the Cape Province (Paarl and Stellenbosch). Friese's species is known only from the female, and I infer that it must be a different species, as he says the tongue is triangular, twice as long as broad. Two species described by Smith as *Andrena* are also placed here; they are certainly different from the present insect. I believe that *Rediviva* must be a distinct genus, near to the ancestral stem of *Dasypoda*. Friese calls attention to the resemblance to *Dasypoda*.

### *Tetralonia sudanica*, sp. n.

♂.—Length about 9 5 mm., anterior wing 8.

Head and thorax black, but densely hairy, legs and abdomen light ferruginous; antennæ in type broken, leaving only the short, stout, clear red scape; eyes light greyish green; inner orbits parallel, facial quadrangle much longer than wide; hair of head yellowish white, pale fulvous on occiput; mandibles dull red; labrum pale red; integument of clypeus entirely black except the rufous lower border; thorax above densely covered with clear fulvous moss-like tomentum, bright orange-fulvous on scutellum; metathorax partly red in middle; sides of thorax with very pale fulvous hair; tegulæ light fulvous. Wings clear, the red stigma very small, the nervures mostly dark; basal nervure falling short of nervulus; second cubital cell very large, hardly smaller than first, receiving recurrent nervure a short distance from end. Legs with pale fulvous-tinted hair, more deeply coloured on inner side of tarsi. Abdomen with dense fulvous tomentum at bases of second and following tergites, on second occupying much less than half in middle, but on the others leaving only the margin exposed.

♀.—Similar, with long hair on hind tibiæ and tarsi; clypeus with lower margin red as in male; antennæ ferruginous, reaching base of scutellum, flagellum darkened above; third antennal joint long, much longer than fourth; fourteen hooks on hind wing.

Sudan: type (♂) in garden, Gendettu, Jan. 27, 1924 (*W. E. Giffard*). Others from same locality and collector; ♂, "from hambuk" (*Abutilon*), Feb. 5, 1925; ♀, "at light," Jan. 30, 1924.

This looks like a small edition of *Tetraloniella graja nursei*, Ckll., and probably will be found to have the palpi of *Tetraloniella.* Compared with *T. g. nursei*, however, it differs not only in the dark clypeus of the male, but also in the much larger second cubital cell, and the marginal cell very obliquely truncate (instead of rounded) at end.

### *Tetralonia gossypii*, sp. n.

♀ (type).—Length about 10 mm., anterior wing 7.

Black, including clypeus, except that the lower margin is narrowly red; labrum dusky red; base of mandibles bright chestnut-red; scape dark reddish, flagellum ferruginous, very bright below; tegulæ pale rufous; legs rufescent, the anterior tibiæ in front and all the femora ferruginous, but variable, more or less suffused with a darker tint; exposed hind margins of tergites broadly reddish brown or reddish, or the extreme margins of first two whitish; eyes very dark grey; facial quadrangle about as broad as long; maxillary palpi excessively minute, three-jointed, the basal joint stout, the others small; first two joints of labial palpi with broad membranous margins, that on first excessively broad, over twice the breadth of the solid part of joint; maxillary blades with evenly spaced long oblique bristles on side next to tongue; hair of face rather dull white; clypeus dull and finely rugose; sides of vertex concave and shining; mesothorax and scutellum dull, but shining along middle of mesothorax and front of scutellum; hair of thorax above rather short and moss-like, strongly suffused with fulvous at anterior corners of mesothorax and sides of scutellum, varying to all greyish; sides of thorax and metathorax with dull white hair. Wings clear, the very small stigma and nervures dark; marginal cell very obliquely truncate and pointed; basal nervure falling conspicuously short of nervulus; second cubital cell very broad, receiving recurrent nervure not far from end; second recurrent nervure meeting outer intercubitus. Legs with whitish hair, more or less stained with fulvous, scopa of hind legs long and very loose; second and following tergites with broad basal bands of dense greyish-white tomentum, on second occupying less than half of tergite, but on fourth leaving only a narrow apical margin, though the extreme base of fourth is dark brown.

♂.—Similar, but not so robust; margins of tergites hardly brownish; clypeus black, with lower margin obscurely brown; labrum black, mandibles not so red; antennæ slender, a little over 4 mm. long, flagellum red beneath but black above; hair of occiput and thorax above fulvous; legs much darker, hind basitarsi with some long black hair.

Sudan: type (♀) from Khartoum, on cotton-flower, Sept. 27, 1926 (*H. W. Bedford*). Another with same data, but Nov. 8; one female, Wad Medani, Sept. 10, 1923, in house (*H. W. Bedford*); ♂, Shambat, on cotton-flower, Sept. 15, 1926 (*Bedford*).

This is a very ordinary-looking species, with strikingly modified mouth-parts, which should place it in the genus *Thygatina*, based on a species from Ceylon. However, the type of *Thygatina* has a very different aspect, and I am inclined to suppose that the present species represents parallel independent evolution. I leave it in *Tetralonia*, with the comment that a revision of the African species assigned to this genus, taking the mouth-parts into account, is greatly to be desired. The general appearance of *T. gossypii* female is just like that of *T. salicariæ*, Lep., but the latter has a pale yellow band across clypeus.

### *Anthophora greyæ*, sp. n.

♂.—Length about 12 mm., anterior wing 9·8.

Black, the abdomen unusually narrow; head ordinary; clypeus (except narrow reddish apical margin above labrum and a black band on each side above), transverse supraclypeal band (failing at sides), lateral face-marks (filling space between clypeus and eye and deeply emarginate above), labrum (except the usual spots), a large suboval mark on base of each mandible, and small stripe on scape in front all bright chrome-yellow; flagellum entirely black; upper part of malar space obsolete; head with long pure white hair, a band of dark fuscous hair on vertex; thorax with long and abundant hair, white beneath, pale grey and strongly mixed with black above; hair of scutellum pale except anteriorly, where there is much black; mesothorax entirely dull, except on the disc posteriorly, where there are two polished impunctate areas; tegulæ light rufo-fulvous. Wings brownish hyaline; basal nervure meeting nervulus; second cubital cell receiving recurrent nervure distinctly beyond middle. Legs black, the middle and hind legs with tarsal joints 2 to 4 and base of 5 red; hair of legs white, bright red on inner side of tarsi; apical joint of middle tarsi thickened and with a black brush on each side; hind legs simple, basitarsi about as long as the other joints together. Abdomen thinly but conspicuously covered with grey hair, the hind margins of the tergites with greyish-white bands; first tergite with extremely long white hair, but apically with much dark hair; a very little dark hair on fifth and sixth tergites before the band; venter with a large clear red area.

Cape Province: Lady Grey, Dec. 11, 1923 (*R. I. Nel*).

A species of the *A. vestita* group. Allied to *A. herbsti*, Friese, but apparently distinct, judging from Friese's brief account. Friese says the face of male *A. herbsti* is like that of *A. schultzei*, Friese, in which case it must be very much paler than in *A. greyæ*. The tegulæ of *A. herbsti* are brown. I commented on the novel and peculiar character of the Lady Grey bee fauna, and Sir Guy Marshall writes in explanation that the locality adjoins the Karroo area, which is very dry, having a rainfall of under 10 inches, which occurs quite erratically. The fauna is peculiar and has not been much collected, as it is useless to go there for insects except after rains.

### *Anthophora punctifrons*, Walker.

Sudan: Khor Inaiet, Port Sudan, June 26, 1926 (*H. B. Johnston*). Another with same locality and collector, but May 10.

These are males, and they appear to agree with *A. punctifrons* as defined by Alfken. In Friese's table of Palæarctic species they run to *A. albigena*, having the end of the abdomen bidentate, but the face is canary-yellow. Alfken states that Friese called the insect *A. albigena*, var. *flaviceps*. It is also very closely allied to the tropical *A. circulata*.

## LII.—*On the Dates of Publication of F. Ruhl's 'Die palaearktischen Grossschmetterlinge und ihre Naturgeschichte.'* By Captain A. F. Hemming, C.B.E.

Relatively little attention has been paid by entomologists to the work entitled 'Die palaearktischen Grossschmetterlinge und ihre Naturgeschichte,' begun by Fritz Ruhl in 1892, and continued after his death by Alexander Heyne, and later by Max Bartel. The work is of importance, as it contains the first published descriptions of a considerable number of MS. names given by Staudinger and other entomologists. As it was published over a period of eleven years (1892–1902), it is desirable, therefore, for the purpose of determining the priority of publication of such names, to ascertain the exact date of publication of the several parts. I have found considerable difficulty in doing this, as neither in the copy in the British Museum nor in that in the Library of the Entomological Society of London are the parts bound up in their original wrappers. I have, however, now fortunately obtained the copy formerly in the library of the late Dr. T. A. Chapman, F.R.S., in which the original wrappers have been preserved. As, so far as I have been able to discover, no list has ever been published of the dates of publication of the various parts in which this work was issued, I think it advisable to take this opportunity of placing on record the facts which I have ascertained. They are as follows:—

BAND 1 TAGFALTER.

| | | |
|---|---|---|
| Lief. 1–2 (Doppel-Lief.) | | 1892, pp. T.P. Vorwort, 1–6, 7–112. |
| 3 | | 1893, pp. 113–160. |
| 4 | | 1893, pp. 161–224. |
| 5 | | 1893, pp. 225–288. |
| 6 | | 1893, pp. 289–336. |
| 7 | | 1893, pp. 337–384. |
| 8 | Oct. | 1893, pp. 385–432. |
| 9 | Dec. | 1893, pp. 433–480. |
| 10 | April | 1894, pp. 481–528. |
| 11 | June | 1894, pp. 529–576. |
| 12 | July | 1894, pp. 577–624. |
| 13 | | 1895, pp. 625–672. |
| 14 | March | 1895, pp. 673–720. |
| 15 | June | 1895, pp. 721–768. |
| 16 (Schluss, Band 1) | | 1895, pp. 769–857 T.P. [2nd Issue] and list of contents. |

BAND 2 NACHFALTER.

| | | |
|---|---|---|
| Lief. 17 | (Bd. 2, 1 Lief.) | 1899, pp. T.P. Vorwort, 1–8, 9–48. |
| 18 | „ 2 „ | 1899, pp. 49–96. |
| 19 | 3 | 1900, pp. 97–144. |
| 20 | 4 | 1900, pp. 145–192. |
| 21 | 5 | 1900, pp. 193–240. |
| 22 | 6 | 1902, pp. 241–288. |
| 23 | 7 | 1902, pp. 289–336. |

Pages 1–384 of vol. i. (Lief. 1–7) were written by Fritz Ruhl. The remainder of this volume (pp. 385–857) was written by Alexander Heyne with the help of such MS. material as Ruhl left at the time of his death. The authorship of new names published in this part of vol. i. should therefore be attributed to Heyne, and not (as is usually done) to Ruhl. Vol. ii. was written by Max Bartel. It was never completed, and ends abruptly in the middle of a sentence.

# LIII.—*A new South African Species of* Rhagadotarsus, *Bredd., representing a new Subgenus (Hemiptera-Heteroptera*, Gerridæ*)*. By W. E. CHINA, M.A.

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THE specimen upon which the following description is based forms part of a fine collection of aquatic Hemiptera made by Mr. G. Evelyn Hutchinson in South Africa. Mr. Hutchinson has already worked out the Notonectidæ and Corixidæ in an excellent paper (Ann. S. African Mus. xxv. pt. 3, pp. 359–474, 1929), in which more exact details of the habitat of the present species will be found in connection with the ecological study of the above-mentioned families. The collection contains many new and interesting forms of Gerridæ which, it is hoped, will eventually be described by Professor Teiso Esaki. It is perhaps necessary to explain why the description of the present form also was not left to him. Believing this specimen to represent a new genus, I had intended to seize this opportunity to dedicate a genus of Gerridæ to my Japanese friend, in recognition of his status as the leading specialist in this family. On submitting drawings of the insect to my good friend Dr. O. Lundblad, however, he expressed the opinion that the differential characters were insufficient to warrant the foundation of a new genus, although he thought that it might perhaps be described as a new subgenus. As the description and drawings had already been made, it was decided to publish them, although Professor Esaki's name has not been used for fear of synonymy. I wish to express my thanks to Dr. Lundblad for his kindly advice and help in this matter.

The genus *Rhagadotarsus* was first described by Breddin (Mitt. Nat. Mus. Hamburg, xxii. p. 137, 1905), and was erected to hold a single Javan species, *R. kraepelini*, Bredd. This same species was later redescribed by Distant as a new genus and species under the name *Nacebus dux* (Ann. & Mag. Nat. Hist. (8) v. p. 153, 1910), and recorded from Calcutta and Lower Burma. In 1918 Bergroth (Philippine Journ. Sci. D. xiii. no. 2, p. 122) synonymized *Nacebus dux* with *Rhagadotarsus kraepelini*, Bredd., and recorded the species from Luzon. In the same year Paiva (Rec. Ind. Mus. xiv. p. 26) identified it from Upper Burma. Later, Esaki (Trans. Nat. Hist. Soc. Formosa, xii. p. 55, 1922) recorded it from Formosa, and recently he has described the winged form from Singapore (Journ. Fed. Malay States Mus. xvi. p. 16, 1930). Professor W. E. Hoffmann also reports this as a common species at Canton, and has done some biological work upon it. The species is therefore widely distributed through the Oriental Region, and the genus, although no other species has so far been discovered, was regarded as a typically Oriental one. The occurrence of a new species in South Africa is accordingly of considerable interest, and suggests the erection of a new subgenus.

## Subfamily *HALOBATINÆ*.

### RHAGADOTARSUS, Bredd., subgenus CAPRIVIA, nov.

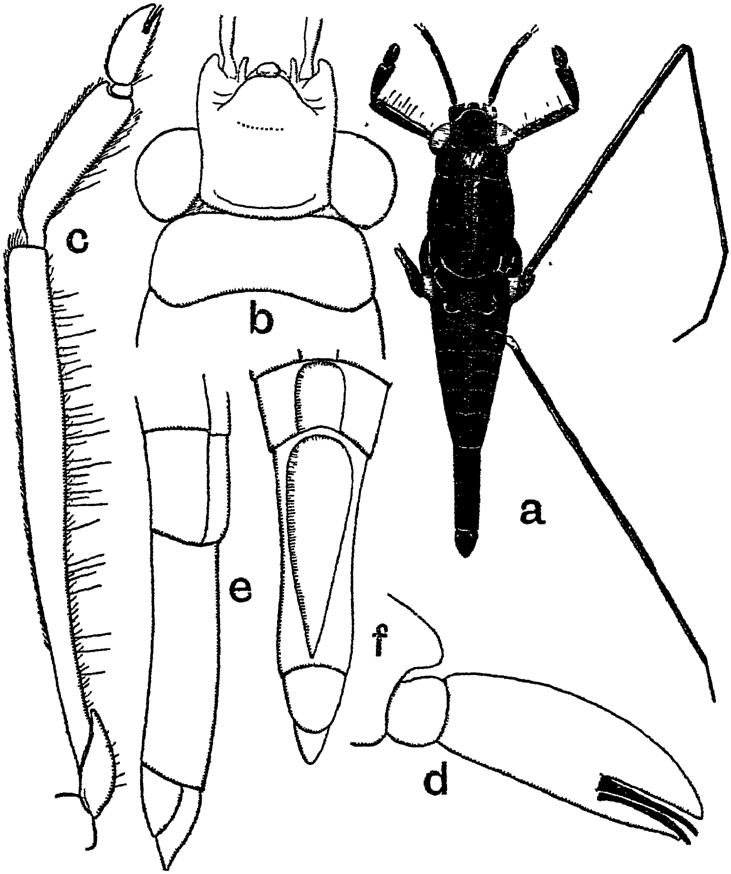
Differs from the typical subgenus *Rhagadotarsus* in the following characters :—

Much more slender and elongate in form, the antenniferous tubercles much more prominent and sides of head in front of eyes consequently more or less parallel (not anteriorly convergent) ; antennæ much longer, the first segment one-and-one-third times length of head (not slightly shorter than head). Pronotum much longer in middle, about one-half the length of head (instead of only one-quarter the length of head). Mesothorax distinctly longer than broad at widest part (instead of slightly shorter than broad). Mesonotum with a percurrent median linear furrow continued down abdomen to seventh segment; posterior margin strongly convex (not truncate). Metasternal acetabula and hind coxæ invisible in dorsal view. Anterior tarsal claws less curved and less divergent. Abdomen (♂) about four times length of head (instead of about three times the length) ; posterior margin of seventh ventrite less deeply angularly emarginate; eighth segment cylindrical, slightly more than twice as long as head instead of only about one-and-one-third times as long as head, its ventral surface less deeply impressed.

Genotype, *Caprivia hutchinsoni*, sp. n.

### *Rhagadotarsus* (*Caprivia*) *hutchinsoni*, sp. n.

*Colour* (♂).—Dull black, with a very fine, short, greyish pubescence; sides of head along inner margins of eyes very obscurely fulvous brown ; eyes grey ; a large anterior median spot on pronotum not reaching posterior margin, fulvous ; a median longitudinal stripe down mesonotum, narrowing posteriorly, pale grey ; all coxæ yellow ; anterior trochanter dull yellow, with lower surface dark brown, base of anterior femur dull yellow ; posterior trochanter and base of posterior femur sordid yellow. Dorsum of abdomen with a pale grey median stripe narrowing posteriorly and extending to fifth sternite, and composed of five spots gradually decreasing in size, one on each sclerite. Ventral surface more or less pale greyish.



*Rhagadotarsus* (*Caprivia*) *hutchinsoni*, subgen. et sp. n., ♂.

a, dorsal view, showing colour-pattern; b, dorsal view of head and pronotum; c, lateral view of front leg; d, front tarsus, showing cleft apex and pair of claws; e, lateral view of apical abdominal segments; f, ventral view of same, showing ventral depressions.

*Structure* (♂).—Elongate and slender, tapering to apex of abdomen. Head slightly longer than wide between eyes (35 : 30) ; vertex rather more than twice as wide as diameter of an eye (30 : 14); distinctly convex, the posterior margin raised and convexly sinuate, the posterior lateral angles more or less prominent; clypeus prominent, strongly delimited from vertex by transverse impression, but relatively shorter (seen from above) than in *Rhagadotarsus kraepelini*, Bredd.; antenniferous tubercles extending anteriorly slightly beyond clypeus very prominent, and consequently sides of head in front of eyes, though sinuate, are more or less parallel and not anteriorly convergent as in *Rhagadotarsus.* Antennæ broken in unique type-specimen, but apparently rather long, the first segment distinctly longer than head (45 : 35), the second rather more than one-fourth the length of first (12 : 45). Pronotum about one-fourth the length of mesonotum (18 : 70), its surface flattened and slightly depressed in middle; posterior margin broadly emarginate. Mesonotum much longer than broad (70 : 58), moderately convex, with a percurrent longitudinal median furrow; posterior margin strongly convexly sinuate; mesosternal acetabula very prominent and easily visible from above. Metasternal acetabula feebly prominent, invisible from above. Meso- and metasterna somewhat flattened. Anterior femur elongate, about three times the length of tibia, and armed below with a row of long slender bristles and numerous shorter hairs; tibia flattened and somewhat dilated, the outer angle of apex somewhat prominent; tarsus cleft at apex, armed with two claws of equal length; relative lengths of femur, tibia, and tarsus in front, middle, and hind legs respectively 85 : 28 : 15, 202 : 129 : 67, and 186 : 74 : 30 (64 = 1 mm.). Abdomen nearly four times as long as wide at base (195 : 50), gradually tapering to the long cylindrical eighth segment, which is slightly longer than width of abdomen at base (56 : 60) and more than three times as long as its own width. Abdominal sternites with a broad median longitudinal depression, deepening and widening on the seventh ventrite, and forming at the base of the eighth a very broad, deep, anteriorly semicircular depression, which gradually tapers and shallows towards the apex of the segment.

Total length 5·2 mm.

*Habitat.* S. Africa, Caprivi Strip; Kubulabula, Vlei, near Linyanti River, 16. vii. 1927 (*G. E. Hutchinson*).

## LIV.—*Descriptions and Records of Bees.*—CXXIX.

By T. D. A. Cockerell, University of Colorado.

### *Sphecodes lustrans*, sp. n.

♂.—Length about 11 mm., anterior wing 9.

Black, including mandibles and antennæ, but tibiæ and tarsi rufous, and abdomen entirely bright red; wings very strongly fuliginous, pallid basally; face densely covered with pure white hair, tubercles with white hair; antennæ long, flagellum strongly moniliform, the swollen portion of the joints with a minute honeycomb-like sculpture all over, the hairy basal part (about a third) of middle joints forming a ring; anterior tibiæ black on outer side, and middle tibiæ with a black band on outer side, but hind tibiæ and tarsi clear ferruginous; second tergite constricted at base; second cubital cell high-subtriangular, the face on marginal nervure very small, recurrent nervure received near end; hind wing with ten hooks.

In appearance this is so like *S. atrescens*, Ckll., that I had hastily supposed it to be the same, until I noticed the totally different mesothorax, which is highly polished, with scattered irregular very strong punctures (very densely punctured in *atrescens*). On further inspection the following differences are also apparent:—Insect less robust, the abdomen considerably narrower, and more brightly coloured; mandibles (which are bidentate) entirely black; flagellum considerably less robust; scutellum with fewer and smaller punctures; area of metathorax better defined, not so coarsely sculptured, with punctures and longitudinal rugæ; posterior face of metathorax extremely coarsely sculptured. The abdomen is shining, with small weak punctures.

Morocco: Ifrane, Aug. 1930 (*Alice Mackie*).

Type in British Museum.

By the sculpture of the mesothorax this resembles *S. sutor*, Nurse (= *S. gibbus*, var. *apicatus*, Smith, according to Blüthgen), but the metathorax and abdomen are quite different. There is similarly a resemblance to *S. crassicornis*, Smith.

### *Andrena pyrura*, Cockerell.

In Amer. Mus. Novitates, 458, pp. 18–19, I discussed the group of *A. commoda*, Sm., and while citing the differences between *A. wilmattæ*, Ckll., and *A. pyrura*. Ckll., held that these were matters of variation. But again going into the matter, I find that the true *A. pyrura* has the basal area of metathorax dull, practically without plicæ *. It is thus to be separated from *A. wilmattæ*, which has strong oblique plicæ. But on this basis, *A. wilmattæ* falls with *A. commoda*, and apparently cannot be separated from it.

### *Panurgus oraniensis*, Pérez.

Morocco: Ifrane, August, 6 ♀, 1 ♂ (*Cockerell*, *W. P. Cockerell*, *A. Mackie*).

In Bees CXXVII. I recorded this as *P. calcaratus*, having before me only a female. But some then unmounted material has now been mounted at the British Museum, and I see that the females average appreciably larger than *P. calcaratus*, while the area of metathorax has a much broader shining rim. This would not be decisive, were it not that I now have a male with deeply arched clypeus, pointed on each side of the arch, labrum briefly but evidently bidentate, middle flagellar joints prominently dentate, and simple hind legs. This can only be *P. oraniensis*, known previously from the male, taken in Algeria. This male, however, differs little from *P. perezi*, E. Saund., taken by Eaton in Portugal. It has darker antennæ, but I should think it only a race, but for the fact that the female has the abdomen like that of *P. calcaratus*, not at all as given by Friese in his table for *P. perezi*.

### *Nomada microsticta*, sp. n.

♀.—Length about 3·5 mm.

Black, without evident spots or bands; the surface shining, with very little pubescence, but a patch of pure white hair on each side of thorax; lower margin of clypeus broadly, labrum and mandibles bright ferruginous; tubercles also red, and tegulæ deep chestnut-red; underside of abdomen brown, more or less pallid at bases of sternites. Wings broadly dusky on apical margin, and especially at apex; stigma and nervures dark; apical tergite with a broad transverse band of white hair. The antennæ are long, reaching end of thorax, very dark brown, with the apex clear red beneath. The following characters are observed with the microscope:—Mandibles simple, dark at end, the base very broad; labrum simple, with large sparse punctures; legs brownish, tibiæ and tarsal joints pallid apically; third antennal joint pallid beneath, hardly shorter than fourth; a minute red spot above each eye; punctures of clypeus scattered, very minute on lower half, much larger on upper half and on supraclypeal area, still larger on sides of face; a strong keel between antennæ; mesothorax shining, with very strong rather dense punctures, a small impunctate space laterad of each parapsidal groove; scutellum bigibbous, strongly punctured, with sparse black hairs; a minute red spot at inner corner of each axilla; basal nervure going basad of nervulus; second cubital cell receiving recurrent nervure at beginning of its last third; third cubital cell much narrower above than second; nervures strong and dark; abdomen minutely lineolate, apex with two inwardly directed tufts of black hair. There are marks representing traces of white hair-bands at sides of tergites.

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* With a high-power binocular very feeble plicæ can be seen at extreme base.

Morocco: Asni, Aug. 1930 (*Alice Mackie*).

This runs nowhere in the published tables, but, except for its very minute size, resembles some of the varieties of *N. flavoguttata* (Kirby). The red spots above eyes and on axillæ are so minute that they are not noticed without the microscope. Dusmet (1915) has recorded no less than forty species of *Nomada* from Morocco, but this is not identical with, or even very similar to, any of them; it is also unlike any of those he describes from Spain.

Type in British Museum.

### *Chalicodoma sicula* (Rossi).

♂.—Morocco: Rabat (*A. Théry*).

The red hair is of a very rich intense colour and extends on to the front, so that the specimen looks very different from an Algerian one; there is, however, no structural difference. I have a female *C. sicula* marked "Atlas."

### *Tetrapedia flavopicta*, sp. n.

♀.—Length about 6·5 mm., anterior wing 6.

Bright ferruginous, with red hair on legs; no black or black hair anywhere, except that flagellum is strongly blackened above and tergites 3 and 4 are variably inclined to be dusky basally; apical half of mandibles brown; clypeus convex, smooth and polished; front below ocelli shining and appearing impunctate, but the microscope shows some scattered weak punctures (the frontal character separates it from *T. acuta*, Vachal, and *T. obtusa*, Vachal); sides of face broadly (ending abruptly a short distance up front) and supraclypeal area suffusedly canary-yellow; eyes light green; mesothorax shining, bare, with a microscopical dense tessellate sculpture; scutellum shining; area of metathorax smooth and polished; tegulæ clear ferruginous. Wings dusky hyaline; basal nervure falling a little short of nervulus; stigma red, nervures fuscous; first recurrent nervure joining second cubital cell not far from end, second recurrent meeting or nearly meeting outer intercubitus. Hind spur with very fine and dense short pectinations. Abdomen smooth and shining.

Six females. Yucatan: Chichenitza (*Bequaert*).

Allied to *T. flava* (Smith), from São Paulo, Brazil, and *T. swainsonæ*, Cockerell, from Jamaica, but the markings and colours of the head readily distinguish it from both. The much larger *T. ferruginea*, Friese, from Brazil, is also similar.

## COLLETES.

The Siberian *Colletes* which I collected in 1927 were as follows:—

| | | |
|---|---|---|
| | Males; malar space moderate ................ | 1. |
| | Females .................................. | 2. |
| 1. | Abdominal hair-bands dull yellowish grey, not white; hair of thorax above fulvous. (Four from Baikal Railway Station, six from Smolenschina.) .......................... | *daviesanus*, Smith. |
| | Abdominal hair-bands white. (Two from Baikal Railway Station, one Irkutsk, one Kychtak.) . | *mongolicus*, Pérez. |
| 2. | Hair of thorax above bright fox-red, contrasting with white of mesopleura; abdominal bands white. (Two from Irkutsk, July.).......... | *mongolicus*, Pérez. |
| | Hair of thorax above not so red, not contrasting with that on pleura. (Thirteen from Smolenschina; three from Baikal Railway Station, visiting flowers of *Tanacetum*; one between Tibeltye and Koltuk.) .................... | *daviesanus*, Smith. |

The *C. daviesanus* was kindly determined for me by Mr. Alfken, and subsequently confirmed by the examination of the abdominal structures. The *C. mongolicus* I had placed as an unknown species allied to *C. montanus*, Mor., but Miss Ruth Sumner mounted the genitalia and ventral plates, and these structures are precisely those of *C. mongolicus*. Pérez describes the male (the female being unknown) as having the hair of head and thorax above lively red, whereas in mine it is yellowish white; but it is bright fox-red in my females. The female clypeus is coarsely longitudinally striate and the malar space is much shorter than broad.

The abdominal bands in both sexes are narrow and greyish white. The male has transverse elevations, interrupted in the middle on fifth and sixth sternites, as described by Pérez.

Female *C. montanus*, Mor., has a very broad face; a tuft of red hair in front of tegulæ, with white hair just above; malar space short.

### *Colletes grandis*, Friese.

The female, from Egypt, is very large, fully 16 mm. long; clypeus very shiny, with a median groove; malar space moderate; tegulæ testaceous, stained with brown; head and thorax with greyish-white hair; abdomen with very broad bands. *Colletes nursei*, Cam., from Deesa and Ferozepore, seems about the same. Male *grandis* is larger, but male *nursei* are very variable in size. The malar space of the male is long. However, dissections may reveal structural characters on which the two can be separated.

Alfken (1926) states that *C. grandis*, Friese, and *C. bracatus*, Pérez, are both identical with *C. lacunatus*, Dours. When I examined *C. lacunatus* at the British Museum I thought it different. My notes are:—Female face broad; malar space short; hair of head and thorax greyish white, short on thorax above, clear white on upper part of face; abdominal bands broad and white; tegulæ deep red. The male placed with it has light red hair on head and thorax above.

Of *C. bracatus*, Pér., I noted:—Egypt; very large, with very conspicuous abdominal bands; male smaller, about 13·5 mm., malar space long, hind tarsi red.

### *Colletes alluaudi*, sp. n.

♂ (type).—Length 9–10 mm., anterior wing 6·5.

Black, the head and thorax densely pubescent, the hair on head and thorax above bright reddish ochreous, varying to creamy white, on face, cheeks and underparts of thorax white; eyes dark brown, strongly converging below; malar space well developed, but broader than long; mandibles black; antennæ black, middle flagellar joints much longer than wide, third antennal joint conspicuously shorter than fourth, fourth and fifth about equal; mesothorax dull, strongly and densely punctured, middle line shining; scutellum shining anteriorly; tegulæ clear reddish testaceous. Wings perfectly clear, stigma pale with dark margin, varying to darker; nervures dark; second cubital cell very broad, receiving recurrent nervure at middle. Base of metathorax with the usual plicæ; apical triangle moderately shining in middle, but plicate at sides, and with a median groove going halfway down. Legs black, with pale hair; tergites with entire dull white apical bands, sternites also with entire bands; first tergite shining, but strongly and closely punctured; second tergite more shining, with smaller punctures, the others with still smaller punctures. Seventh ventral plate closely resembling that of *C. eous*, Morice, the lobes similarly formed, and with similar long petioles; genital armature more like that of *C. dimidiatus*, Brullé, but the stipites have the terminal portion more distinctly set off from the middle part, which is swollen, yet not so much so as in *C. succinctus* (L.); the sagittæ are very broad apically, much in the style of *C. mongolicus*, Pér.

♀.—Similar, but larger and more robust, the dorsal hair of head and thorax very brightly coloured; malar space shorter, more than twice as broad as long; abdominal bands stained with ochreous; clypeus dull, very densely punctured and striate, a subapical transverse band shining; the second tergite has a well-developed basal band (as in *C. balticus*, Alfk.). This female has the aspect of *C. picistigma*, Thoms., but the surface of the first tergite is much smoother, much less densely or rugosely punctured, and distinctly glaucous. The tegulæ are darker than in the male.

Morocco: Asni (type-locality), Aug. 6–7 (*Cockerell*, *W. P. Cockerell*, *A. Mackie*); Ifrane, Aug. 26 (*A. Mackie*, *W. P. Cockerell*). These are males; I took the only female at Ifrane, Aug. 29.

A female from Rouiba, Algeria, is referred here, though it is somewhat smaller and the first tergite is not at all glaucous; the hair-band at base of second tergite is about or almost twice as wide as that on apex of first. This species is named after the well known entomologist, who was the first to collect a bee (*Ceratina cucurbitina*) at Asni. It is certainly very near to *C. eous*, Morice, and *C. cecrops*, Morice, but distinct from both on structural characters. There is a species collected by Mavromoustakis in Cyprus which is extraordinarily similar in the male abdominal structures, but is easily separated by the seventh ventral plate, the expanded portions (lobes) having the patch of fine hair not nearly extending to the base, whereas in *C. alluaudi* the hair is much more extensive, and there are long outstanding hairs down the basal part of the lobe externally to the narrowest portion of the structure. There is also some difference in the eighth ventral plate, *C. alluaudi* having the portion below the apical process broader.

### *Xylocopa barbatella*, sp. n.

♀.—Length 14·5–16 mm.

Steel-blue, with scutellum and most of first four tergites green; mesothorax with an impunctate discal green patch, ringed with rosy red and (outermost) yellow; face suffused with green; face, occiput, and cheeks posteriorly with white hair, vertex with short black hair; scutellum with white hair, and some black on disc; pleura with black hair; a very conspicuous tuft of pure white hair just below the green tegulæ; legs green, with black tarsi, which are thickly clothed with black hair. Wings strongly smoky, nervures dark. Scutellum conspicuously but not densely punctured. Abdomen punctured like scutellum, without hair-bands; apex on each side fringed with long white hair, but in middle with black.

Three females.

Allied to *X. lateralis*, Say, but much smaller, with more metallic abdomen. Closest to *X. barbata*, Fabricius, but easily separated by the well-punctured scutellum, cheeks not covered with white hair, and the white tuft below tegulæ. The wings are longer than in *X. barbata*, and the second cubital cell is more produced basally. There are more punctures on the clypeus and supraclypeal area than in *X. barbata*.

Yucatan: Chichenitza, June 1929 (*Bequaert*).

### *Xylocopa pervirescens*, sp. n.

♀.—Length 14 mm.

Bright yellowish green, the head blue-green, becoming bluer in region of ocelli; legs dark reddish, partly metallic at bases of middle and hind femora; scape and flagellum dark red beneath; tegulæ clear castaneous. Wings yellowish hyaline, nervures dusky ferruginous. Mandibles bidentate; labrum with a central tubercle, on each side of which are red hairs. Cheeks and occiput with white hair; face with white hair mixed with black; vertex with black hair; clypeus dull, closely punctured, but there is a yellowish-green band in middle of clypeus, which extends upward on supraclypeal area as a shallow trough; sides of face dull and black; frontal keel low. Mesothorax well punctured except the discal area, which is smooth and slightly coppery; scutellum with scattered very small punctures, the anterior margin impunctate; mesopleura steel-blue, dullish, with small punctures. Legs with pale hair, red on underside of tarsi. Abdomen closely punctured, so as to appear quite rough, the tergites with appressed pale ochreous or almost orange hair, denser and forming rather inconspicuous bands on margins; apex with red hair in middle, then black, and outwardly white; venter with white hair-bands, but on fifth sternite copper-red; apex beneath with black hair.

One female. Yucatan: Chichenitza (*Bequaert*).

Very close to *X. subviresceus*, Cresson, but that species has white hair on the apical margins of the tergites, more after the fashion of *X. viridis*, Smith.

## LV.—*A new Mantid from Baluchistan.*

By B. P. Uvarov.

### *Microthespis evansi*, sp. n.

♂ (*type*).—Small and slender, resembling a species of *Ameles* in general appearance.

Antennæ long, slender.

Head about half as broad again as the pronotum in its widest portion. Facial shield trapezoidal, twice as broad as high, with the upper margin strongly arched; surface flat. Eyes moderately prominent, round.

Pronotum with the metazona twice the length of the prozona. Prozona strongly narrowed forward, with the apex parabolic. The expansion is half as wide again as the narrowest part of the metazona, which is parallel-sided in its posterior two-thirds.

Anterior coxa shorter than pronotum, with six short acute spinules along the front margin. Anterior tibia with 6–7 spines externally and 12 spines internally.

Supra-anal plate elongate, tongue-shaped, with the sides concave. Cerci somewhat longer than the plate.

Buff-grey. All the large spines of front femora black behind. Prosternum without black pattern. Costal area with a sharply defined ivory-white margin. Main veins of elytra with brownish streaks. Anal membrane blackish, with a broad pale margin. Hind wings smoky, with an eye-spot at the apex.

Total length 30; pronotum 8; front coxa 5; elytron 20 mm.

Described from a single male taken by Mr. J. W. Evans at Quetta, Baluchistan, 27. vii.–8. viii. 1929, and presented to the British Museum through the Imperial Institute of Entomology.

Only one species of the genus *Microthespis* has been described so far, viz., *M. dmitrievi*, Werner, known at present from Djibouti and Harrar on the Somali coast of Africa (Werner, Ann. Mus. Zool. St. Petersb. xiii. 1908, p. 120), Bushire, S.W. Persia (Uvarov, Journ. Bombay Nat. Hist. Soc. xxviii. 1922, p. 355), and from Jericho, Palestine (Uvarov, Ann. & Mag. Nat. Hist. ser. 10, vol. v. 1930, p. 631). The original description of *M. dmitrievi* being very short and lacking some important details, I have asked Miss E. Miram, of the Petrograd Zoological Museum, to examine the type, and the information kindly communicated by her enabled me to separate the Baluchistan insect from *M. dmitrievi*. The main points of difference are as follows:—

| *M. dmitrievi.* | *M. eransi.* |
|---|---|
| Prosternum with a black transverse band in front of its middle and a large elongated black spot in front of the hind margin. | Prosternum without black pattern. |
| Costal margin of elytra unicolorous; anal membrane blackish except at the base. | Costal margin of elytra ivory-white; anal membrane blackish, with the base and the margin pale. |

The genus *Microthespis* has been placed by Giglio-Tos ('Das Tierreich,' 50 Lief., Mantidæ, 1927, p. 483) next to *Rivetina*—indeed, the two genera are extremely closely allied, and the only character by which Giglio-Tos separated them is the number of tibial spines. This character, however, is not sufficiently reliable, the number of the spines being not always the same on two tibiæ of the same individual. It is impossible therefore to separate the two genera except by the size, the known species of *Microthespis* being both very small; but even in this respect the genera are linked up by *Rivetina inermis*, which I have described from S.W. Arabia (Journ. Bombay Nat. Hist. Soc. xxviii. 1922, p. 353), and which may be referred to *Microthespis* just as conveniently as to *Rivetina*. The reason why I abstain from synonymizing *Microthespis* with *Rivetina* is that I have recently found in the British Museum collection a pair of *Microthespis dmitrievi* labelled "Kurrachee?," which should obviously mean Karachi, in India. The female is brachypterous, and its subgenital plate is unarmed as in *Bolivaria*, while in *Rivetina* it should be provided with a pair of spines; and this character, though present in one sex only, may be considered of generic value. *Microthespis* cannot be identified with *Bolivaria*, on account of the supra-anal plate in *Bolivaria* being short and broad, while it is strongly elongated in both *Rivetina* and *Microthespis*.

## LVI.—*A new Sitatunga from the Bahr-el-Ghazal.*

By J. St. Leger, F.Z.S.

The British Museum has lately received, through the kindness of Major P. M. Larken, two headless skins with a skull and horns of a Sitatunga from the Nile–Congo Divide, 50 miles S. of Yambio, about 4·30′ N. and 28° E., and another juvenile skin with a smashed skull from Yambio.

The adult skins are remarkable in that the coat is not as thick and shaggy as usual, but much more thin and scanty in texture than in any known species, and the white lateral and transverse stripes and spots are even more clearly marked than in *L. gratus* of the West Coast.

This Sitatunga, which appears to be closely related to the type-species, may be named

### *Limnotragus spekei larkeni*, subsp. n.

Coat shorter and sparser than usual. Colour dark chocolate-brown, only slightly darker on underparts; central dorsal stripe white from withers to rump (stripe is brown on the rump in one specimen); 5–8 well defined white transverse stripes and a well-marked white lateral band; numerous (12–15) white spots on haunches; the usual white gorgets on throat and chest. Fore legs white on inner side at base; hind legs with a white stripe extending from the base to at least as far as the knee (unfortunately the hooves have been cut off and a portion of the leg-skin is apparently missing). Legs whitish below knee; spots on pasterns faint. Tail mixed dark brown and white.

*Skull.*—Measurement of type: greatest length 300; basal length 280; interorbital width 84; upper tooth-row 87·5, $m^3$ moderately worn. Length of horns along curve 550; girth at base 185; tip to tip 275.

*Type.*—Adult male, B.M. no. 31.6.16.1 (skin, skull, and horns), from 50 miles S. of Yambio.

The ground-colour of the skins of the Sitatunga does not appear to be a feature of much importance, as different animals show great variation from the same locality. This is well-marked in a splendid series sent by Capt. C. R. S. Pitman from Entebbe, the skins (seven adult males) showing every shade between deep chocolate-brown and the dull "mouse"-brown of *L. s. sylvestris* of Nkosi Island.

The juvenile skin, barely half-grown, is the same dark chocolate-brown in colour as in the adults, but the coat is longer and more shaggy, approaching in texture that of the adult of *L. s. spekei.* The white markings are as in specimens of *L. s. spekei* which have retained their red/white striped juvenile coat to a late age, for this change from the juvenile to the adult colouring appears to be a matter of individual variation, a young male from Kazinga Island, with horns barely perceptible on the cleaned skull, showing the typical red white striped juvenile colouring, whilst another male from the Mesorgi Islands apparently of the same age, although the skull is unfortunately missing, is of the adult brown non-striped coloration. Again, a skin from Entebbe of a semi-adult male, with horns about half an inch in length, is still in the red infantile coat, although the stripes have disappeared, whereas a younger male from Nkosi Island with horns only just sprouting, has already attained the brown coat of the adult male.

Major Larken contributes the following notes on the habits of this Sitatunga:—

"The animal in question seems to live in what might be described as Bongo country, in streams of a forest type, where there is also thick undergrowth. Such streams are usually small, flowing in a deep bed or ravine. The bottoms are soft, of course, in the rains, but the streams themselves are usually no more than very small brooks where the Sitatunga are found, though they get bigger down their courses. It is said by the Azande people to frequent the water-courses and to lie hid in them when alarmed, although how it does this in such small streams I do not understand. Azande name is 'Duruga.'"

## LVII.—*On the Dates of the Parts of 'Meigen (J. W.), Syst. Besch. Eur. Schmett.'* By Francis J. Griffin, A.L.A., Registrar, Entomological Society of London.

Having occasion to require the dates of certain portions of the text of 'Meigen's Syst. Besch. Eur. Schmett.,' I approached my friend Dr. C. Davies Sherborn with a request for information. This was immediately forthcoming from his unpublished records, and I publish the results herewith with his approval and permission.

Meigen (J. W.).

Systematische Beschreibung der Europäischen Schmetterlinge mit Abbildungen auf Steintafeln. 3 Bde. 4to. [1827–] 1829–1832. Illust. col. 13 parts.

| Band I. | Band II. | Band III. |
|---|---|---|
| 1. Pp. 1–40. 1827. | 1. Pp. 1–40. 1829. | 1. Pp. 1–48. 1830. |
| 2. Pp. 41–90. 1828. | 2. Pp. 41–88. 1829. | 2. Pp. 49–96. 1831. |
| 3. Pp. 91–122. 1828. | 3. Pp. 89–136. 1829. | 3. Pp. 97–144. 1832. |
| 4. Pp. 123–170. 1829. | 4. Pp. 137–212. 1830. | 4. Pp. 145–192. 1832. |
| | | 5. Pp. 193–276. 1832. |

## LVIII.—*An African Chloropid (Dipt.) predaceous upon Spiders' Eggs.* By J. R. Malloch, Bureau of Biological Survey, Washington, D.C.

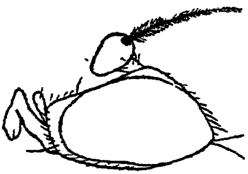
In a lot of material sent me recently by Sir Guy A. K. Marshall there are three specimens of a species which present the first case of predacity on spiders' eggs in the family Chloropidæ known from Africa, though there are species in the New World closely related to the present one which have this habit. Unfortunately all three of the mounted specimens lack the third antennal segment, but an undeveloped specimen taken out of the cocoon which is mounted with one specimen has these organs and the aristæ intact, which provides me with a basis for the generic placement of the species.

In some of my other papers on the family I have stated that there are very poor grounds for the differentiation of the genera *Gaurax*, Loew, and *Oscinosoma*, Lioy (= *Oscinella*, Becker), the only character cited as a general rule being the distinctly haired arista in the former and the bare or almost imperceptibly haired arista in the other. There may be other and more reliable characters for the sharp definition of *Gaurax*, but this is not the place to go into that matter, and I need only state that the present species has the arista quite densely covered with black hairs, the longest of which are over twice as long as the basal diameter of the arista, and that this character brings it within the scope of the genus as generally accepted.

### *Gaurax dissimilipes*, sp. n.

*Male and Female.*—Shining testaceous yellow, with the following portions black: the aristæ and their hairs, a spot between the ocelli, a vitta on each side of disc of mesonotum, which is wider in front than behind and does not reach either extremity of the mesonotum, and a large spot on the mesopleura; dorsum of abdomen broadly infuscated on each side, the hypopygium of male yellow and the genital segments of female black; fore tibiæ and tarsi and hind tarsi fuscous, hind tibiæ fuscous above except the sensory area. Wings hyaline. Halteres yellow. Bristles and hairs mostly yellow, sometimes the fronto-orbital and vibrissal setulæ dark.

Frons fully 1·5 as long as its width at vertex, slightly narrowed from back to front, the lateral margins with four or five setulæ which are stronger than the discal hairs, the vertex with four well-developed bristles, the median pair cruciate and apparently the postverticals; ocellars short but evident, erect and slightly convergent at tips; profile as in figure; eyes densely haired, facets uniform in both sexes; face narrowed below, at vibrissæ distinctly narrower than at antennal insertions, the vibrissæ small but differentiated, slightly upcurved; antennæ of rather large size, as shown in figure; proboscis stout; palpi normal. Thorax with numerous dorsal hairs which are pale and decumbent, the usual three notopleurals present; scutellum rounded in outline, flattened on disc, with a slight margin and four bristles at apex, the central pair longest. Abdomen narrowly ovate. Legs longer than usual but quite stout, even the hind tibiæ slightly thicker than normal, the tarsal claws very small in both sexes. Wings rather large, the surface-hairs evenly distributed and larger than in most related genera; penultimate section of third vein about half as long as penultimate section of fourth, the latter distinctly shorter than the ultimate section of fifth; veins 3 and 4 slightly divergent at apices.



Head of *Gaurax dissimilipes*, sp. n., from the side.

Length 2·5 mm.

*Type*, male, with which is mounted a spider cocoon containing remains of puparia and food, allotype, and one male paratype, Njala, Sierra Leone, 4. v. 1928 (*E. Hargreaves*). I have mounted also on the card with the type-specimen an undeveloped specimen taken from the cocoon and from which the details of the antennæ are taken, as none of the reared example before me have these organs intact.

Becker recorded only two species of this genus from Africa*, and one of these, *plumiger*, Meigen, has since been placed in the genus *Rhodesiella*, Adams; it has the legs black, with the tibiæ and tarsi yellow. The second species,

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* Ann. Mus. Nat. Hungar. vol. viii. p. 429 (1910).

*secundus*, Becker, has the mesonotum shining black and black-haired, and the legs black, with trochanters, knees, and the two basal segments of tarsi yellow. It is possible that the second species does not belong to *Gaurax*. I have seen neither.

## BIBLIOGRAPHICAL NOTICE.

*Life by the Seashore: an Introduction to Natural History.* By MARION NEWBIGIN, D.Sc. (Lond.). With many original Illustrations by FLORENCE NEWBIGIN. Rewritten and revised by RICHARD ELMHIRST. London: George Allen & Unwin, Ltd., 1931. Pp. 296; 20 pls.

THE main object of this book, in its revised form, is (to alter slightly the wording of the original Preface) "to enable those who have not had a special biological training to learn the names and characters of the common plants and animals of the rock pools." Only such forms as can easily be examined with the aid of a good lens are included, and throughout the fact that there is no easy path to the rapid labelling of specimens is emphasized. Extensive keys are given to aid in the determination of the sea-weeds and of all the more important groups of animals, and the nomenclature is standardized by the second edition of the 'Plymouth Marine Fauna' (1931). The book is therefore likely to be of use to the student and to the teacher of biology in schools as well as to the amateur. Anyone who will take the trouble to use the keys provided will not fail to understand Mr. Elmhirst's "Outline Classification of Shore Animals" in the second chapter (p. 25). It is to be regretted that the popular names, such as "Primitive Animals" for Protozoa, have been retained in the headings of the subsequent chapters. Also, the Polyzoa are sufficiently unrelated to the various unsegmented worms lumped together under "Primitive Worms" (chap. vii.) to be given a separate heading in the same way as the Pycnogonida on p. 190.

The book is much more than an aid to classification. The student is encouraged to study each animal in relation to its environment, to observe its habits, to enquire into its relationships, and to understand the means whereby self- and racial preservation are secured. It is to be regretted that in such a practical work no instructions are given as to how to preserve specimens (apart from such a casual mention as that on p. 85). Often even those who are engaged on ecological work send, for identification, delicate animals that arrive in hopeless condition, with a request for instructions as to methods of preservation.

There is an index and a useful list of books of reference.

I. G.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 47. NOVEMBER 1931.

# LIX.—*Exotic* Muscaridæ (*Diptera*).—XXXV.

## By J. R. MALLOCH.

### Family **Muscidæ**.

### Subfamily *SCATOPHAGINÆ*.

This subfamily is one which causes the beginner in its study considerable difficulty, and this is not by any means removed with a growth in the knowledge of the group, as there are many genera in which the species are prone to vary greatly in size, chætotaxy, and colour, while other genera present striking dimorphism in the sexes. It is essentially a northern group, no species except a few of the genus *Scatophaga* occurring in the tropics. The genus *Tapeigaster*, Macquart, which has been recorded only from Australia, does not belong to this subfamily, as Bezzi stated, but to the Neottiphilidæ. The common *Scatophaga stercoraria*, Linné, has been recorded from South Africa, and there are three or more species in the New World extending south of the southern border of the United States, one occurring in Peru and Colombia. Many species are common in Europe and North America.

I do not intend to present a revision of the subfamily herein, as that would involve too much space, and, in addition, my key to the genera of Muscidæ of the world, now practically ready for the press, will take care of the generic differentiations, but there are some species in my hands which call for treatment, and it is those that I deal with herein. I have tried to refrain from the erection of unnecessary genera, and where genera are erected I have dealt with them in a comparative manner, so that any student of the group with related genera in hand may readily arrive at a conclusion as to the relationships of the new genera and those already described.

### Genus POGONOTA, Zetterstedt.

This genus was distinguished from *Okenia*, Zetterstedt, in Becker's revision of the European Scatophagidæ * by the more elongate mesonotum, the presence of two additional cross-veins between the third and fourth veins in the male, and the bearded jowls and different hypopygium of that sex. I have carefully examined several species which would fall within these two genera, and below I present some data on the American forms, including the genotype of *Pogonota* (*hircus*, Zetterstedt) which is found in Alaska.

I have carefully examined males and females of *hircus*, and find that, while it resembles two of the North American species very closely, it can invariably be distinguished from them by the lack of fine hairs on the prosternum. In some other subfamilies the presence or absence of hairs on this plate would indicate a generic distinction, but in this subfamily it is, in my opinion, less desirable to utilize this character as a generic criterion, because of the liability to variation in the degree of hairing, even to the extent that fine hairs may be present or absent in different individuals of the same species. My inclination to retain in this genus the two species with haired prosternum was strengthened by an examination of the hypopygia of all three, which are so very similar in structure that it is with difficulty that one can discern distinctions. And an additional incentive to consider the species as merely belonging to subgenera was added when I discovered that in the species of *Okeniella* the prosternal plate also bears fine hairs. I therefore hold the opinion that the three segregates below should be considered as subgenera of *Pogonota*, and present a key for their identification and segregation.

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* Berl. Ent. Zeitschr. vol. xxxix. p. 77 (1894).

### *Key to the Subgenera.*

1. Prosternum bare; male with one or two extra cross-veins between the third and fourth wing-veins which are lacking in the female ........................ *Pogonota*, Zetterstedt.
   Prosternum with some fine pale hairs; male with normal venation except that there is sometimes a very short stump of a vein near apex of second vein on the posterior side as in most males of *Pogonota* ...... 2.
2. Fourth wing-vein slightly bent forward at apex in both sexes....... ............ *Okenina*, subgen. nov.
   Fourth wing-vein slightly bent downward at apex in both sexes.................... *Okeniella*, Hendel.

### Subgenus Pogonota, Zetterstedt.

### *Pogonota hircus*, Zetterstedt.

This species is common in the north of Scotland, and occurs also in Alaska.

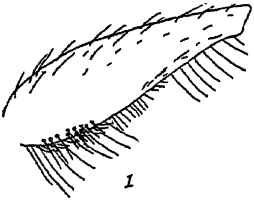
### Subgenus Okenina, nov.

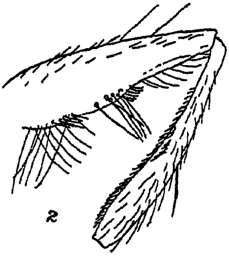
This subgenus is erected for the reception of two closely-related North American species, one of which is undescribed. In the male of one species there occurs a character that to some extent connects it with *Pogonota*, sen. str., the second wing-vein having a distinct spur emanating from its posterior side close to the apex. This spur-vein is lacking in all the females of the species and in the male of the new one described below. To distinguish the two I present below a synopsis of the specific characters. The characters apply to males only, the female of *pallida* being unknown.

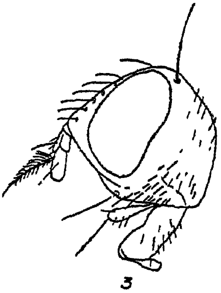
Genotype, *Cordylura fulvibarba*, Loew.

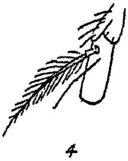
A. Hind coxæ with quite dense stiff black hairs on their inner surfaces; fore femur with the armature as in fig. 1, all the bristles on the anterior side black; the long bristle near base of ventral surface of mid-femur black; second wing-vein with a short spur on posterior side near apex; the downwardly projecting pale processes of the hypopygium much emarginate on their lower margin centrally, so that the process appears to have a leaf-like dilation on each extremity .... *fulviburba* (Loew).

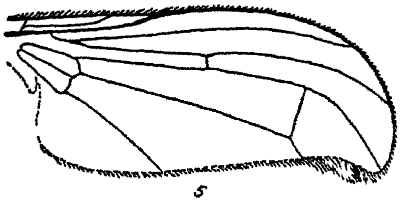
AA. Hind coxæ with yellow hairs on inner surfaces; fore femur with the armature as in fig. 2, the basal group of bristles on anterior surface yellow, the others black; second wing-vein without a preapical spur; the downwardly projecting pale processes of the hypopygium straight on their lower extremities.......................... *pallida*, sp. n.











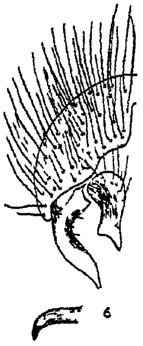


Fig. 1.—*Pogonota* (*Okenina*) *fulvibarba*, fore femur of male.
Fig. 2.—*Pogonota* (*Okenina*) *pallida*, same.
Fig. 3.—*Acicephala polita*, head of male from the side.
Fig. 4.—*Acicephala polita*, antenna of same, more enlarged.
Fig. 5.—*Pleurichæta simplicipes*, wing of male.
Fig. 6.—*Scatophaga nigripes*, hypopygium of male, one side from behind, with apex of forceps from the side (below).

### *Pogonota* (*Okenina*) *fulvibarba* (Loew).

*Cordylura fulvibarba*, Loew, Berl. Ent. Zeitschr. 1872, p. 97.

The female of this species can be distinguished from that of other genera by the haired prosternum, the slightly forwardly curved apical section of the fourth wing-vein, the presence of a broad oval patch of small black bristles on the greater part of the basal three-fourths of the ventral surface of the fore femora, and of short decumbent black spinules on the ventral surface of the fore tibiæ, and the bare first wing-vein.

*Localities.*—Bilby, Alta., Canada, July 20 & 28, 1924 (*O. Bryant*).

### *Pogonota* (*Okenina*) *pallida*, sp. n.

*Male.*—Similar in colour and general habitus to *fulvibarba* (Loew). Head orange-yellow, frons more fulvous above, frontal orbits, triangle, and the entire occiput, densely grey-dusted; third antennal segment infuscated apically; aristæ black; palpi whitish yellow; beard fulvous. Thorax and abdomen fuscous, the ground-colour obscured by dense brownish-yellow dust, the mesonotum with traces of dark vittæ. Abdominal hairs, including the long upwardly directed fasciculus of bristles on each side near apex, yellow or fulvous, the hypopygial hairs black. Legs fulvous-yellow, fore coxæ with a dark posterior vertical stripe, mid and hind coxæ fuscous; hind coxæ with pale yellow hairs on inner sides. Wings hyaline, held against a dark background and at certain angles, with the costal margin rather broadly whitish, veins yellow at bases, becoming brownish apically and there with a slight border of brownish. Halteres yellow.

Frons with four verticals, the ocellars, and about seven orbitals on each side well developed; third antennal segment subangulate at apex above; aristæ bare, distinctly swollen at bases; palpi slightly lanceolate; beard well developed. Thorax with 2+3 rather fine dorsocentrals, one sternopleural, and four marginal scutellars, the disc of the scutellum with a few fine hairs. Abdomen distinctly longer than thorax, tapered on apical segment, with the same keel-shaped ventral ridge running forward on the segment, which bears the fasciculæ as in *fulvibarba*, the prow-like anterior extremity, however, more elevated than in that species, and the downwardly-projecting process on each side of it distinguished as in key. The anteroventral bristling on the fore femora is quite different from that of *fulvibarba*, the basal group of the bristles being yellow and well separated from the one just basad of the middle (fig. 2). In other respects very similar to *fulvibarba*.

Length 9 mm.

*Type*, Ottawa, Canada, July 19, 1914, no collector's name on label.

### Subgenus OKENIELLA, Hendel.

This group was originally called *Okenia* by Zetterstedt, but that name was preoccupied, and Hendel, in 1907, proposed the above name to take its place.

I have seen the genotype (*caudata*, Zetterstedt) and one North American species of the subgenus, the latter being apparently widely distributed throughout northern Canada and Alaska.

### *Pogonota* (*Okeniella*) *caudata* (Zetterstedt).

This species is distinguished from the North American one in the male sex by a peculiar group of hairs on the costa of the wing at apex of the subcostal cell, which character is very well figured by Becker *.

The only examples of the species which I have seen were taken by Dr. J. M. Aldrich in Sweden.

### *Pogonota* (*Okeniella*) *kincaidi*, Coquillett.

This is the only species of the subgenus known to me to occur in North America. Apart from the shorter section of the costa between the apices of the subcosta and first vein and the very noticeable long fine hairs at that point, there is little to distinguish *caudata* from the present species, the general habitus and structure even of the hypopygium being very similar in both.

The species occurs as far west as the Pribiloff Islands and as far east as Churchill, Man. There is a very large series of specimens in the Bryant collection, from practically all localities in the north-west in which that gentleman has made collections.

It appears highly probable to me that this species is the same as *dasyprocta*, Loew, which is commonly met with in northern and arctic Europe and Asia, but I have no specimens from these regions for comparison with the American examples, and cannot give a definite opinion on the point.

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* Berl. Ent. Zeitschr. 1894, pl. viii. fig. 4.

### Genus ACICEPHALA, Coquillett.

This and the next two genera dealt with in this paper are distinguished by the elongate head, which has the face receding below and the lower occiput swollen and projecting well behind the posterior margin of the eye (fig. 3). It is the only genus of the subfamily which I know in which there is a very well-developed fine hair on the outer surface of the third antennal segment close to the insertion of the arista (fig. 4). Coquillett placed two species in the genus and subsequently two more were included by Curran, but I restrict the genus to its genotype. The other three species which have been described are placed by me in two distinct genera, dealt with below. The face in *Acicephala* is entirely and quite densely covered with grey dust.

Genotype, *Acicephala polita*, Coquillett.

North America.

### Genus PSEUDACICEPHALA, nov.

Very similar to *Acicephala*, differing from it in lacking the fine hair on the outer surface of the third antennal segment, and in having two rather deep glossy black foveæ on the upper half or more of the face. The other characters are almost identical with those of *Acicephala*.

Genotype, *Acicephala pilosella*, Coquillett.

The three species now known to me may be separated as below.

#### *Key to the Species.*

| | | |
|---|---|---|
| 1. | Humeri distinctly duller than the disc of the mesonotum, their surfaces slightly shagreened and thinly dusted, most noticeable when viewed from behind against a light.. | *pilosella*, Couquillett. |
| | Humeri as glossy as disc of the mesonotum when seen from any angle .............. | 2. |
| 2. | Lower half of the face and lower portion of central carina densely whitish-grey dusted.. | *alberta*, Curran. |
| | Lower half of face grey-dusted only along the lower margin......................... | *marginata*, sp. n. |

### *Pseudacicephala pilosella* (Coquillett).

Occurs in Colorada, New Mexico, and some adjoining states, but not extending into Canada, where its place is taken by the next species.

One specimen sent to the British Museum.

### *Pseudacicephala alberta* (Curran).

Apparently not uncommon in western Canada. Curran originally distinguished it from *pilosella* by the colour of the hairs of the abdomen, stating in his key that in this species only the basal two tergites are yellow-haired and the remainder black, while in the male of *pilosella* the basal three tergites are yellow-haired and in the female of that species all are pale-haired. It is rather hard to determine the colour of the hairs, and I prefer to refrain from the use of this character, though in some specimens it appears to hold fairly well.

All the type-series were from Banff, Alberta, from which locality I have seen one specimen. The other localities are Kannaskis, Alberta, and John Smith Ranger Station, Cochetopa, National Park, Colo. Specimen sent to British Museum.

### *Pseudacicephala marginata*, sp. n.

Very similar to the preceding species, being glossy black except the grey-dusted pleuræ, and with the legs glossy black with tibiæ and tarsi yellow. Palpi dusky.

Structurally similar to *alberta*.

*Type*, Reno, Nevada (*Wickham*).

### Genus PARATIDIA, nov.

This genus is very similar to *Acicephala*, but lacks the hair on the outer surface of the third antennal segment. The face is entirely dusted and almost without traces of foveæ, the postvertical bristles are present and of moderate length, while in the two preceding genera they are lacking or microscopic, and the stigmatal bristle is well developed, while it is lacking in the other two genera. The swollen lower occiput will distinguish the genus from others in the family except the two just dealt with. Curran stated that this species "can hardly remain in *Acicephala* because of the presence of humeral and stigmatic bristles," but the humeral is frequently present in the two preceding genera.

Genotype, *Acicephala intermedia*, Curran.

Originally described from Aweme, Manitoba, the type being a female. I have now before me a female specimen from Calgary, Alberta, 31. v. 1924 (*O. Bryant*).

### Genus TRICHOPALPUS, Rondani.

This genus as limited by Coquillett contains but one species—*fraternus*, Meigen. The second species included in the genus in Becker's paper on the subfamily * was removed by Coquillett to his genus *Chætosa*, and I accept this as a valid genus. Curran in 1927 described *nigribasis*, sp. n., from Canada. I have carefully examined the description †, and have no hesitation in stating that it is a synonym of *Opsiomyia palpalis*, Coquillett, which I linked with the genus *Trichopalpus* in my report on the "Diptera of the Canadian Arctic Expedition." Although I ran both genera out at the same caption in my key and made no effort to distinguish one from the other, I took that action because I had neither genus before me at that time. I have now the two genotypes, and present the following data :—The male of *Trichopalpus* has no very long hairs on the proboscis, while in *Opsiomyia* there are many long yellow bristly hairs on the theca; the femora of the mid and hind legs, especially in the male, are much thicker than those of the hind legs in *Opsiomyia*, and the mid-tibia has a submedian anteroventral bristle in both sexes, while in *Trichopalpus* the femora are much less noticeably swollen, and the mid-tibia of at least the male has no submedian anteroventral bristle.

I have seen no North American examples of true *Trichopalpus fraternus*, Meigen, the only accepted species of the genus.

### Genus OPSIOMYIA, Coquillett.

This genus contains only one species, *palpalis*, Coquillett. I have a number of specimens before me from the following localities : Bilby, Alberta, July 28, 1924, and Good Hope, N.W.T., 23. viii. 1920 (*O. Bryant*), and Fairbanks, Alaska, 2. vii. 1921 (*J. M. Aldrich*).

A specimen will be sent to the British Museum.

### Genus CHÆTOSA, Coquillett.

This genus is distinguished from *Trichopalpus* by the possession of an anterior sternopleural bristle which is much weaker than the strong posterior one. Rarely it is difficult to make out this additional bristle, but almost invariably it is distinguishable on at least one side. In some other genera there are two sternopleural bristles, but usually these are both on the posterior portion of the sclerite. In all other respects the genus is very similar to *Trichopalpus*, and might possibly be more correctly ranked as a subgenus thereof.

Until recently I knew of but one species referable here, despite careful examination of a large number of specimens from Europe, Siberia, and North America, but a few months ago I met with a new species amongst some material collected at Churchill, on the Hudson Bay. This I describe below.

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* Berl. Ent. Zeitschr. vol. xxxix. p. 77 (1894).

† Can. Ent. vol. lix. p. 255.

### *Key to the Species.*

1. Processes of fifth abdominal sternite of male tapered to a rounded point, each with a group of short closely-placed black spinules on its inner margin on basal half, the tip half almost uniformly wide and without evident hairs or bristles ................ *punctipes*, Meigen.

Processes of fifth abdominal sternite of male shorter and not as distinctly tapered, without a group of short black spinules on inner margin of basal half, and with a thorn-like process near apex on inner side of each, which consists apparently of a number of black bristles which adhere to each other.. *churchilli*, sp. n.

### *Chætosa punctipes* (Meigen).

A common and very widely-spread species in northern Europe, Siberia, and North America. I have seen specimens from Laggan, Banff, Bilby, Kannanaskis, and Slave Lake, Alberta, Churchill, Manitoba, and Aklavik, and McPherson, N.W.T., Canada (*O. Bryant*). Specimens will be sent to the British Museum.

### *Chætosa churchilli*, sp. n.

With difficulty separable from the genotype, the only character that is of outstanding significance being that listed in the above synopsis. The thorax and abdomen are fuscous, and slightly shining, with the dust more brownish than in *punctipes*, the anterior half of the frons and the entire face and cheeks are of a yellowish-white colour, and the antennæ are pale yellow, with the second segment slightly infuscated; palpi yellowish white; aristæ fuscous. Legs yellow, mid and hind coxæ and extreme tips of mid and hind femora fuscous. Wings yellowish hyaline. Halteres yellow. Lower occipital hairs white; bristles black.

Rather smaller than *punctipes*, but general structure similar; inner cross-vein of wing close to middle of discal cell.

Length 3·5 mm.

*Type*, and one male paratype, Churchill, Manitoba, 25. vi. 1930 (*O. Bryant*).

### Genus PLEUROCHÆTA, Becker.

Mem. Imper. Acad. Sci. Petrograd, vol. xxviii. no. 7, p. 63 (1915).

This genus was described from the Arctic Ural region and placed in the same section as *Hydromyza*, Fallen, though compared more with *Pogonota*, Zetterstedt. I have before me a series of specimens of both sexes of the genotype *fulviseta*, Becker, taken in the Canadian Arctics, and present below some data upon the species, as the papers in which it was originally described are not generally accessible. The wing-structure of the male is very distinctive (fig. 5), and can be confused only with that of *Cosmetopus*, Becker. In the course of my work in identifying this species, I found that Becker had described the genotype twice, the first under the name *Cosmetopus simplicipes*, from Siberia. It appears strange that any systematist could err in describing such a very characteristic species twice, even after a period of fifteen years had elapsed since the first description *, but I believe the evidence is incontrovertible. The species will therefore be known as below.

### *Pleurochæta simplicipes*, Becker.

The male has the lateral edges of the third, fourth, and fifth abdominal segments armed with long yellowish bristles, which on the first two are usually directed downward and very conspicuous, the hypopygium has processes somewhat similar to those of *Okeniella*, the fore femur has no anteroventral bristles, but has a short ridge near apex on that surface which is furnished with rather dense short soft yellow hairs, and the posteroventral surface has a series of rather inconspicuous short black setulæ on the median portion; the fore tibia has ventral setulæ as in *Microprosopa*, Becker, and several other genera, but has no wart-like processes as in *Cosmetopus dentimanus*, Zetterstedt. The female has the wing normal in shape and the fourth vein very slightly bent downward at apex, the fore femur stout and without any distinct ventral setulæ, the fore tibiæ with short ventral setulæ as in the male, the stigmatal bristle lacking, and the palpi spatulate.

Length 5–6 mm.

*Locality.*—Herschell Island, N.W.T., July 18–20, 1930 (*O. Bryant*).

One pair will be sent to the British Museum.

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* Acta Soc. Scient. Fenn. vol. xxvi. no. 9, p. 50 (1900).

### Genus AMAUROSOMA, Becker.

This genus has much the same characters as *Orthochæta*, Becker, but the apex of the first wing-vein is bare, and the apical pair of bristles on the scutellum is very small, the preapical pair long and strong. Usually there are some strong bristles on the anteroventral or anterior surface of the fore femur, occasionally two series, but rarely there is but one or two such bristles, and there are included also species in which these bristles are lacking. In all the species except one that I have seen the centre of the propleura is haired, the exception being *nuda*, Malloch, which is also unique in being almost entirely testaceous-yellow, with only the third antennal segment brown. I have seen no species lacking fore-femoral armature.

I describe one new species below.

### *Amaurosoma atripes*, sp. n.

*Male and Female.*—Black, distinctly shining, the thorax and abdomen dusted with grey, most densely so on pleura, the female rather brownish-dusted on disc of mesonotum, and more nearly without dust on dorsum of abdomen. Head black, anterior margin of frons orange-yellow, the entire frons with white dust which is most evident when seen from in front, the face dusky in centre, but overlaid with white dust, as are also the yellow parafacials and anterior portions of the cheeks; antennæ black, aristæ concolorous; palpi whitish yellow, darkened at bases. Legs black, bases of tibiæ yellowish, the fore pair most noticeably so. Wings greyish hyaline, veins black. Halteres dull brownish yellow. Calyptræ whitish.

Frons a little longer than wide, with three supraorbitals, the upper two on each orbit curved outward, the lower one proclinate, the infraorbitals incurved, three or four in number; third antennal segment broader in male than in female, and fully twice as long as second, its upper apical angle quite sharp; arista with the second segment about twice as long as thick, third thickened on basal third in male, to beyond that in female; palpi normal; cheek about as high as width of third antennal segment. Thorax normal, most of the pleural hairs and some of their bristles yellowish; apical pair of scutellar bristles fine and short. Abdominal hairs and bristles on basal three segments pale yellow, beyond that mostly black in male, in female all hairs and bristles black. Fore femur in both sexes with ten to twelve black bristles in a double series on anteroventral surface;

mid-femur with four or five anteroventral bristles. Processes of fifth sternite of male longer than wide, slightly spatulate and directed downward in most specimens. Ultimate section of fourth vein two or three times longer than penultimate section, longest in the male.

Length 3·5–4 mm.

*Type*, male, allotype, and six paratypes, Herschell Island, July 20 & 25, 1930 (*O. Bryant*).

Paratypes will be sent to the British Museum at request of the collector. The type will probably be deposited in the United States National Museum.

### *Amaurosoma pallidipes*, Malloch.

This species is quite similar to *flavipes*, Fallen, or at least to those specimens of the latter which have the femora yellow, but the coxæ in *flavipes* are fuscous and in *pallidipes* they are entirely yellow. The abdominal hairs and bristles in the latter are yellow, while in *flavipes* they are largely fuscous.

*Habitat.*—Eastern States.

### Genus MESAMYIA, nov.

This genus is one of the few in which the centre of the propleura is bare. It is quite similar to *Amaurosoma nuda*, Malloch, in all particulars except that the fore femur lacks bristles on the anteroventral surface. Should the lack of propleural hairs be taken as a character of primary generic importance in the subfamily, and I am inclined to consider it thus, it would be possible to place in this genus *nuda* and any other species with this character which has three sternopleural bristles, the apex of first wing-vein bare, and the arista merely pubescent. There is a quite distinct apical bristle on each palpus, but it is not nearly as conspicuous as in *Cordylura* and related genera, and the second antennal segment does not form a cap or flap over the base on the third segment on its inner side.

*Genotype*, the following species.

### *Mesamyia testacea*, sp. n.

*Female.*—Shining testaceous-yellow, frons, face, cheeks, and lower occiput with white dusting of variable intensity according to the angle from which the various parts are viewed. Wings hyaline, veins dull yellow.

Frons over one-third of the head-width, each orbit with two supraorbitals, the upper backwardly curved, the anterior one proclinate, and four or five incurved infraorbitals; outer verticals shorter than the inner pair and about equal to the postverticals, the latter shorter than the ocellars; antennæ extending to below middle of face, third segment over 1·5 as long as second, slightly angulate at upper apex; arista pubescent, second segment about as long as wide, third thickened at the extreme base; palpi rather short and moderately stout, with several bristles, the one at apex longer than the others; parafacials about as wide as third antennal segment; face without distinct foveæ; cheek deepening behind, below middle of eye as high as width of third antennal segment, with four or five long black bristles on lower margin which are as long as the vibrissæ, and a similar bristle just below the latter, as well as several shorter and finer bristles. Thorax with 2+3 dorsocentrals, 3 sternopleurals, the posterior one longest, both propleural and stigmatal bristles present, four bristles on hind margin of mesopleura; scutellum with two short apical and two long preapical bristles. Abdomen longer than thorax, all tergites with moderately distinct apical bristles on sides. Fore femur with a series of about seven posteroventral bristles which are longer basally, and no anteroventral bristles; fore tibia with one short bristle on the anterodorsal surface beyond the middle and a much longer one on the posterior surface nearer the middle; mid-femur with one bristle near apex on the anterior and posterior surfaces, and traces of some weaker anterior bristles basally; mid-tibia with four bristles on the following surfaces respectively: anteroventral, anterodorsal, posterodorsal, and posterior, the last-mentioned very small and weak; hind femur with some widely spaced anterodorsal and anteroventral bristles; hind tibia with one anteroventral, two posterodorsal, and two anterodorsal bristles. Wings normal; first vein bare; sixth vein traceable to margin; inner cross-vein distinctly beyond middle of discal cell; ultimate section of third and fourth veins slightly curving downward, the latter nearly twice as long as the penultimate section.

Length 5·5–6 mm.

*Type* and one paratype, Colorado, no other data. United States National Museum.

### Genus Scatophaga, Meigen.

This is the most widely distributed genus in the subfamily, and it contains the best-known and commonest species both in Europe and America. In the works of the old authors too great dependence was placed upon colour-characters in the determination of species, and even some recent workers have put too much confidence in colour, size, and the degree of hairiness in distinguishing certain species. The amount of variation in these characters in such species as *furcata*, Say, and *stercoraria*, Linné, is very great, and care hasto be taken less mistakes are made in identifications. I am of the opinion that the condition of the pabulum of the larvæ and sometimes also the season of the year have much to do with the size and degree of hairiness of particular specimens, and it appears worthy of note that even the latitude affects them, as the more northern specimens are usually darker, larger, and more hairy than the southern examples of the same species.

There are several names available for subgenera in the group and it may be well to note these here to clarify the situation lest someone takes the attitude that either genera or subgenera be erected for the reception of some of the more or less well-differentiated sections of the genus.

The accepted genotype of *Scatophaga* (*Scathophaga*) is *stercoraria*, Linné. This species has the pteropleura haired, the arista plumose basally, and the fifth abdominal sternite of the male with two short submedian processes and the lateral angles of that sternite drawn out into moderately long narrow lobes. The genotype of *Scatina*, Robineau-Desvoidy, is *claripennis*, Robineau-Desvoidy, considered as a synonym of *merdaria*, Fabricius, by Becker, and as the latter is generally accepted as identical with *stercoraria* these generic concepts are synonymous. *Scatomyza*, Fallen, has as its genotype *Musca scybalaria*, Linné, the designation being by Coquillett in 1910. This species, and one or two others, has the hind margin of the thorax between the base of the abdomen and bases of the hind coxæ convex and evenly chitinized instead of, as in other species, with the central part more or less distinctly depressed and soft; the pteropleura is bare. *Pyropa*, Say, has as its genotype *Pyropa furcata*, Say, which is the same ae *squalida*, Meigen, and one of the most widely distributed and most common species of the genus. The pteropleura is bare, the arista is pubescent, and the fifth abdominal sternite of the male, while possessing two short submedian processes on the hind margin as in *stercoraria*, lacks the posteriorly produced lateral lobes of that species, and is more like that of *suilla*, Fabricius. *Aminia*, Robineau-Desvoidy, has been synonymized with *Scatophaga* ; its genotype is *parisiensis*, Robineau-Desvoidy, a species of doubtful identity. The most recently erected genus of the lot is *Scatophagella*, Szilady, with the genotype *pubescens*, Szilady, from Europe.

The genus is apparently susceptible to subdivision on the basis of characters of at least as much significance as those that are utilised for the recognition of genera in other sections of the subfamily, but whether the adoption of such a course is commendable or not is another matter, and I believe that taking everything into consideration the best course is to allow all the species to remain in one genus.

I present below some data upon certain species with descriptions of some others.

### *Scatophaga furcata* (Say).

*Pyropa furcata*, Say, Journ. Acad. Sci. Phil. vol. iii. p. 98 (1823).
*Scatophaga squalida*, Meigen, Syst. Beschr. Zweifl. Ins. vol. v. p. 252 (1826).

I present the above synonymy of this common species as there appears to be some reluctance in accepting it in Europe. There is no question as to the identity of the North American specimens with those from Europe, as indicated by Collin, though he does not use Say's name for the species. When my paper on the Probiloff Island Diptera was submitted for publication the numbers on the plates did not agree with the type in use in the publication to which the paper was sent, and they were changed to conform. Unfortunately in changing them those on plate 19 were made to run consecutively, which changed the numbers 21 and 22, so that the central figure in the second series on the plate was made 21 instead of 22 as originally arranged, thus wrongly giving the first as the fifth abdominal sternite of *islandica* and 22 as *furcata*. I never had both the plates and text at one time when the paper was going through the press, hence did not discover the mistake until after it appeared in final form. I did, however, rectify the error in 1924 * when describing *monticola*. Apparently this correction has escaped the eye of Mr. Collin as he again points out the error in a recent paper †.

### *Scatophaga vittata*, van der Wulp.

*Scatophaga vittata*, van der Wulp, Biol. Cent.-Amer. vol. xii. p. 350 (1897).

This species is very similar to *furcata*, but the specimen before me has the arista more distinctly short-haired than any I have seen of the latter, and the femora all have a streak on the upper surface which is not the case in, at least, American examples of *furcata*. I hope to definitely decide the specific status of this Mexican form before I publish my key to the species of the genus which is practically ready for the press.

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* 'Psyche,' vol. xxxi. no. 5, p. 195.

† Ann. & Mag. Nat. Hist. ser. 10, vol. vii. p. 90 (1931).

### *Scatophaga lutaria*, Fabricius.

In my report on the Canadian Arctic Diptera in 1919 I figured (pl. x. fig. 35 *a*) the fifth abdominal sternite of a species which I took to be *lutaria*. Lately in my work on the genus I have gone over all the European material in the United States Museum and find that I was in error in my acceptance. The Scottish specimens of the species which I collected many years ago have the fifth abdominal sternite different in structure from the American examples, the two apical submedian processes being almost undeveloped, mere convexities, and less densely and longer haired. I have seen no specimens from America which can be accepted as identical in all respects with the European examples.

### *Scatophaga pallida*, Walker.

*Scatophaga pallida*, Walker, List Dipt. Ins. Brit. Mus. pt. 4, p. 981 (1849).

*Scatophaga nigrolimbata*, Cresson, Ent. News, vol. xxix. p. 137 (1918).

This is the species of which I figured the fifth sternite as above referred to. I have before me a series of specimens from White Mts., N.H., and New York, which agree very well with the description, but the abdomen is rarely marked with black apices to the tergites and is generally largely fuscous on the entire dorsum. Structurally it comes close to *lurida*, Schiner, having the same type of fifth abdominal sternite in the male, but it has the antennæ entirely orange-yellow, and the legs of the same colour, while the third antennal segment in *lurida* is black as are also the bases of the femora. Both species belong to the same group as *suilla*, having the arista plumose basally, and the pteropleura bare; they differ, however, in having no distinct clouding of the cross-veins of the wings. Cresson suggested the above synonymy when he described his species.

### *Scatophaga suilla*, Fallen.

This species occurs widely throughout North America and was recorded and figured in the paper referred to under *lutaria* in this paper (pl. x. fig. 35). The two central apical processes of the fifth abdominal sternite in the male are fused at bases and longer than in other species known to me.

I have not been able to compare the North American specimens with any from Europe, so am not absolutely certain of the identification.

### *Scatophaga nigripes*, Holmgren.

*Scatophaga nigripes*, Holmgren, Ent Tidskr vol iv. p. 172 (1883).
*Scatophaga islandica*, Becker, Berl. Ent. Zeitschr. vol. xxxix. p. 175 (1894).

The above synonymy is undoubtedly correct, but I am not convinced that the species is identical with *litorea*, Fallen, despite a rather definite statement by Collin that *nigripes* is a synonym of the latter.

There are about ten species of the genus known to me in which there are distinct hairs on the pteropleura, this being one of them, and *stercoraria*, Linné, another; I am not in possession of *villipes*, Macquart, which is the other known to Collin according to a recent statement by him *.

At present I distinguish *litorea* from *nigripes* by the much stronger anteroventral bristle on the mid and hind tibiæ in both sexes, this being as strong as the anterodorsal series, while in *nigripes* it is hardly distinguishable from the fine hairs in the male and quite weak in the female. This character may not hold, but I lack a good series of *litorea* to check up on. The hypopygia of specimens of *litorea* from Dunoon, Scotland, collected by the writer, and of *islandica* from Churchill, Hudson Bay Territory, collected by Owen Bryant, are apparently identical, but there is not very much difference between the hypopygia of quite distinct species in this genus as a rule, so that absolute dependence cannot be placed upon that feature. I present a figure of hypopygium of the Churchill male (fig. 6).

### *Scatophaga lanata*, Lundbeck.

*Scatophaga lanata*, Lundbeck, Meddel. om Groenl. vol xix. p. 116 (1895).

This species belongs to the same group as *furcata*, having the pteropleura bare and the arista almost so, but the cross-veins of the wings are not clouded, and the hind tibia has usually two anterodorsal and one or two posterodorsal bristles. The only distinction between the paratypes which I have examined and the description of *nigrolanata*, Cresson †, from West Greenland, lies in the larger size and longer body-hairing of the latter, but these are variable characters and possibly they are the same species.

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* Ann. & Mag. Nat. Hist. ser. 10, vol. vii. p. 90 (1931).
† Ent. News, vol. xxix. p. 186 (1918).

### *Scatophaga lanata*, Szilady.

*Scatophaga lanata*, Szilady, Ann. Mus. Nat. Hungary, vol. xxiv. p. 595 (1926).

This species-name has been previously used in the genus by Lundbeck, and I propose to substitute for it *tropicalis*, n. n. The species is very similar to *stercoraria*, Linné, but the male has the two processes on the central portion of the apex of the fifth abdominal sternite much shorter, and the lateral posterior angles of that segment are not at all produced, but rounded. In both sexes the hairs on the hind tibiæ are fulvous-yellow and much longer than in *stercoraria*, most of them as long as the bristles, and of the latter only two, on the anterodorsal surface, are black, the others being of the same colour as the hairs and almost indistinguishable from the latter.

Originally described from Bolivia, I have seen it from Peru in the collection of the United States National Museum.

The pteropleura is haired in this species, and the aristæ are plumose basally.

### *Scatophaga palpalis*, sp. n.

*Female.*—Very similar to *suilla*, Fallen, having the pteropleura bare, and the arista plumose basally, with both cross-veins of the wings distinctly clouded, but it is generally darker in colour, with the third antennal segment deep black except at its extreme base, the thorax fuscous with brownish dusting, the humeri yellowish, and the abdomen blackish on dorsum and with brownish dusting. The fore femur in all four specimens before me has a fuscous posterior streak, the other pairs being fulvous-yellow.

Structurally there is little distinction between the two species, but the palpi in the new one are very distinctly widened apically, much as in typical species of the genus *Lispa*, Latreille, while in *suilla* they are slightly and gradually widened.

Length 6·5–7·5 mm.

*Type* and three paratypes, Laggan, Alberta, Canada, Sept. 1, 1925, one paratype, topotypical, Aug. 21, 1925 (*O. Bryant*).

Type to be deposited in United States National Museum, paratype in British Museum.

## Subfamily *MUSCINÆ*.

### Genus MORELLIA, Robineau-Desnoidy.

### *Morellia bispinosa*, sp. n.

*Male.*—Very similar to *calyptrata*, Stein, having the same white mesonotal marks, the sublateral postsutural white vitta quite pronounced, and the white-dusted marks on the abdomen very similar, except that the pair of spots on the second visible tergite are smaller and almost round, and the lower calypter, instead of being yellowish, is very distinctly infuscated from near base to near hind margin, the latter being white and the fringe also of that colour. The halteres are whitish yellow.

Structurally similar to *calyptrata*, but differing in the armature of the hind tibia. The fore tibia lacks median posterior hairs and bristles, the mid-femur has a very pronounced apical dorsal elevation which is furnished with several strong bristles, the mid-tibia has several posterior bristles of moderate length which are not in a single series, and the posterior surface is slightly carinate basally and armed with the usual series of closely placed erect black setulæ which become weaker as they approach the middle; hind tibia with the calcar long, the anterodorsal surface with a series of short setulæ from base to well beyond middle terminating in a longer and stronger bristle, and two long slightly curved anteroventral bristles beyond the middle. The last character is distinctive. The species will run down to *calyptrata*, Stein, in my key to the species of the genus published in 1923*, having the presutural dorsocentral bristles undeveloped and the lower calypter fuscous with the hind margin and fringe whitish, but *calyptrata* has the lower calypter yellowish, not fuscous, and the hind tibia with the anterodorsal hairing longer and looser.

Length 6·5 mm.

*Type* and one male paratype, Vumbu Mts., S. Rhodesia, x. 1926 (Rhodesia Museum): 2 male paratypes, Umtali, S. Rhodesia, iv. 1929 (*A. Cuthbertson*).

Type to be deposited in the British Museum.

*Morellia femorata*, Curran, is another species of this group, but it has whitish lower calypter and is possibly the same as *minor*, Malloch, described a few months prior to it.

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* Ann. & Mag. Nat. Hist. ser. 9, vol. xii. p. 505.

## Family Sapromyzidæ.

### Genus Homoneura, van der Wulp.

### *Homoneura loewi*, sp. n.

*Female.*—Testaceous-yellow, slightly shining. Interfrontalia brown on sides, the frontal orbits, face, and cheeks greyish-white dusted; antennæ and palpi testaceous, apices of latter narrowly fuscous; ocellar spot blackish. Thorax with slight greyish dusting, the mesonotum with four reddish-brown vittæ, the central pair widely separated anteriorly, converging posteriorly and carried over the disc of scutellum, which is yellow on margin and has a mere line of yellow down centre; postnotum testaceous. Abdomen without dark markings of any sort. Legs testaceous-yellow. Wings as in *obliquipunctata*, Macquart, with both cross-veins brown-clouded, most broadly so at their extremities, a subquadrate brown spot on apex of second vein and a slightly more rounded and less intense spot immediately below it on third vein, which is more or less connected with it, and a third spot, which is even paler, on middle of apical section of fourth vein.

Frons a little longer than wide, all the bristles, including the postvertical pair, long and strong, orbits at anterior extremities about as wide as interfrontalia; arista plumose. Thorax with the usual three pairs of strong dorsocentrals, no intra-alar, but one pair of prescutellar acrostichals, about twelve series of intradorsocentral hairs, no prealar, and two sternopleurals; scutellum flattened on disc, with four marginal bristles. Abdomen ovate, flattened, apices of all tergites from second to fifth with rather widely spaced and quite long bristles. Fore femur with the anteroventral comb rather fine; mid-femur with the usual anterior bristles on apical third or more, and an apical posterior bristle; mid-tibia without posterior bristles and with three or four apical bristles; hind femur with three or four fine short closely placed setulæ at apex of anteroventral surface; all tibiæ with the preapical dorsal bristle well developed. Inner cross-vein about three-sevenths from apex of discal cell; third and fourth veins slightly but distinctly divergent apically.

Length 4 mm.

*Type*, Ibadan, S. Nigeria, 28. iii. 1919 (*A. W. J. Pomeroy*). British Museum.

This species is very similar to *Sapromyza obliquipunctata*, Macquart, which I am certain belongs to this genus, but it has three series of black spots on the abdomen, which are lacking in the new species. Although I have seen one species of the genus in which there is a colour-dimorphism in the abdomen of the sexes, it is not as striking as would be the case here, and I hardly expect that this species is the same as that described by Macquart.

### *Homoneura sexvittata* (Curran).

*Sapromyza sexvittatus*, Curran, Bull. Amer. Mus. Nat. Hist. vol. lvii. p. 350 (1928).

This African species undoubtedly belongs to *Homoneura*, and to the same segregate as the species above described. It also appears possible that it is the same as *Sapromyza terminalis*, Loew, the descriptions of the two species being very similar. However, I cannot go further than to suggest the synonymy without an examination of the types.

### *Homoneura trinotata* (Loew).

*Sapromyza trinotata*, Loew, Öfv. Vet.-Akad. Forh. 1862, p. 8.

This species resembles *loewi* very closely, but has the palpi yellow, metanotum blackish, margin of each abdominal tergite fuscous, and is smaller, 2·5 mm.

Africa.

### *Homoneura guttulata* (Macquart).

*Sapromyza guttulata*, Macquart, Dipt. Exot. Suppl. 1, p. 203 (1846).

A species which is rather similar to *terminalis*, Loew, differing in the markings of the wings.

Africa.

The above species and also *Sapromyza ringens*, Loew, were investigated in connection with the identification of *loewi*. It would appear necessary to indicate that *ringens* does not belong to either *Homoneura* or *Sapromyza*, Fallen, as at present accepted, but just what genus it may belong to is beyond me to suggest without an inspection of the type-specimen, or at least an example of the species. Some of the black species referred to *Lauxania* by Loew and other authors belong to *Homoneura*, but I am unable to give any particulars of these at this time for lack of sufficient material.

## LX.—*On new* Curculionidæ (*Col.*) *from the Pacific Islands.* By Sir Guy A. K. Marshall, C.M.G., F.R.S.

### Subfamily *Ithyporinæ.*

### Genus Cranopœus, Mshl., 1931.

Since this genus was described I have had an opportunity, through the kindness of Mr. A. M. Lea, of the South Australian Museum, of seeing specimens of the genotype of *Fergusonia*, Lea, 1911. At first sight the Samoan species of *Cranopœus* seemed to be obviously congeneric with Lea's Queensland species, but closer examination revealed the following differences :—

In *Cranopœus* the funicle has seven joints ; the tarsi bear two claws and the claw-joint extends well beyond joint 3 ; the median area of the mesosternum is sloping.

In *Fergusonia* the funicle has six joints ; the tarsi have only a single claw and the claw-joint is very short, not extending beyond the setæ of joint 3 ; the median area of the mesosternum is vertical.

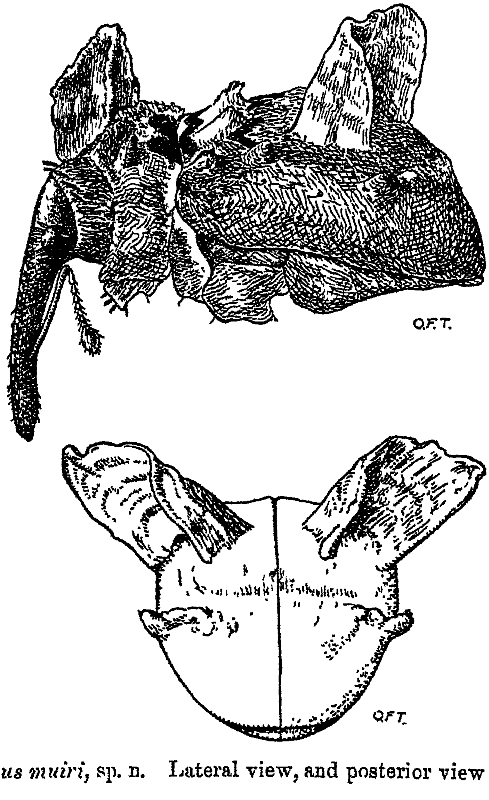
It is possible that when more species are known these distinctions may break down, but as they hold good in the five new species of *Cranopœus* here described, it seems desirable to retain the latter as a distinct genus.

### *Cranopœus muiri*, sp. n. (Fig. 1.)

♂. Derm piceous-brown to blackish, covered throughout with a dense fulvous-brown waxy secretion, which forms a high crest in the middle of the prothorax and two very large processes on the elytra shaped like horses' ears, as well as several other small prominences ; prothorax with a transverse dark brown patch on each side of the base, the margin of the basal angle on both prothorax and elytra edged with whitish ; elytra with a very indefinite or macular, curved, common, dark brown band at about one-third from the base.

*Head* smooth, impunctate, with a small frontal fovea, but the surface normally hidden by secretion ; forehead appearing impressed (owing to inequality of the secretion) and with a few erect setæ adjoining each eye. *Rostrum* elongate (about 2 mm.), longer than a front femur, subcylindrical, but slightly widened and dorso-ventrally compressed at the apex ; antennæ inserted at five-eighths from the base ; the dorsum with very fine dense confluent punctation throughout, with a narrow median carina (interrupted by a small fovea between the antennæ) and a faint trace of another carina on each side, and sparsely set with short erect setæ. *Antennæ* with the scape rather abruptly clavate and the club with a fringe of setæ; funicle as in the genotype. *Prothorax* transverse, widest at the base, narrowing to beyond the middle and there very strongly constricted, the constriction continued deeply across the disk (but interrupted in the middle) and the apical part tubulate; the dorsum very strongly convex both transversely and longitudinally, highest behind the middle, the apex being much lower than the base; the basal margin deeply bisinuate, the apex arcuate dorsally with a median sinuation; the median ridge bearing a very high (about 1 mm.) longitudinal crest, which is subtriangular in lateral view, the posterior edge being almost vertical and the anterior strongly curved backward, and with

Fig. 1.



*Cranopœus muiri*, sp. n. Lateral view, and posterior view of elytra.

a narrow lateral flange down each side; a short (0·3 mm.) conical wax process on each side just behind the constriction; a transverse row of eight stout erect setæ just within the apical margin. *Elytra* a little longer than broad (10 : 9), jointly trisinuate at the base, with the shoulders strongly produced into a sharp angle, parallel-sided from behind the shoulders to three-fourths, then very rapidly narrowing to the broadly rounded apex; the dorsal outline flat from the base to the middle, then sloping steeply to the apex; the strongly punctate striæ almost entirely concealed by secretion, intervals 3 and 5 being a little higher than the others; each elytron bears at the top of the declivity a broad high (1·6 mm.) curved waxen process, shaped somewhat like a horse's ear with the cavity directed backwards; when the process is removed its basis is seen to be a horseshoe-shaped patch (with the opening behind) of long matted hairs, the arms of the horseshoe being on intervals 3 and 5; behind the shoulder a conical wax process similar in size and shape to the humeral angle; near the base of intervals 3 and 5 a large erect tuft of wax-covered setæ; just behind the ear-like process a transverse ridge of wax, which becomes higher externally; very short sparse setæ are visible through the secretion on the declivity. *Legs* coated with secretion and set with very stout erect setæ, including the two basal joints of the tarsi.

*Length* 4·25–4·3 mm., breadth (at shoulders) 2·7 mm.

Fiji: Rewa, Viti Levu, 3 ♂♂, xii. 1905 (*F. Muir*).

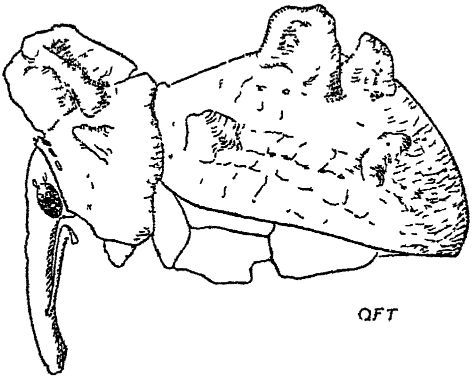
Closely allied to the genotype, *C. turritus*, Mshl. (Ins. Samoa, iv. fasc. 5, 1931, p. 275, figs. 8, 9), but differing in its larger size and much higher and differently shaped wax processes; the pronotum in *turritus* is much less convex transversely, and the uncus on the tibiæ is black, being testaceous in *muiri*.

### *Cranopœus galeatus*, sp. n. (Fig. 2.)

♂. A very small species, but similar in general structure to *C. muiri*, sp. n.

*Rostrum* proportionately shorter, as long as a front femur, more dilated at the apex, but similarly sculptured. *Prothorax* less transverse and less deeply constricted beyond the middle, but equally convex; the dorsal crest rhomboidal in lateral view with the apex broadly truncate, sloping forward, with the front and hind margins parallel, much larger than the elytral processes and twice as high, and with low obtuse lateral flanges; the lateral wax prominences much stouter than in *muiri*; a transverse row of three very stout erect setæ on each side of the front margin. *Elytra* shaped as in *muiri* and as densely covered with brown secretion, but with a very indefinite transverse whitish band close to the base and an even less distinct one across the top of the declivity; in the middle of the disk a low ear-like wax prominence with its cavity directed obliquely *forwards* towards the shoulder, being supported on a low hairy horseshoe-shaped costa lying mainly on intervals 3 and 5; immediately behind this process and touching its base another obtusely conical one on intervals 2 and 3, of nearly the same height and having three obtuse flanges; behind this again on the declivity a low transverse wax ridge from intervals 4 to 7; the shoulders roundly rectangular when denuded, but normally bearing an angular wax projection, but with no process behind it, and no sub-basal tufts on intervals 3 and 5; the setæ on the declivity hardly long enough to penetrate the layer of secretion.

Fig. 2.



*Cranopœus galeatus*, sp. n.

*Length* 2·25 mm., breadth 1·4 mm.

Fiji: Rewa, Viti Levu, 2 ♂♂, iii. 1906 (*F. Muir*).

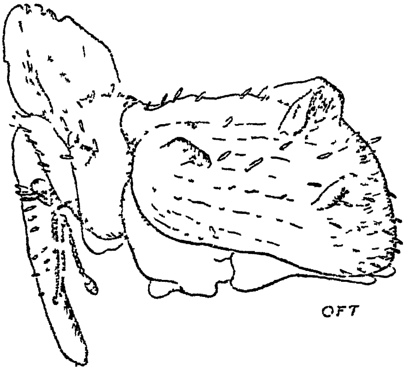
It is probable that the angular projections on the shoulders of the elytra in *C. turritus* and *C. muiri* are also produced by wax and not by the chitinous structure of the elytra.

### *Cranopœus veitchi*, sp. n. (Fig. 3.)

♂. Piceous-brown, with dense greyish-brown waxy secretion and processes; elytra with a small oval brownish-black spot on the suture at about one-fourth from the base.

Rather smaller than *C. galeatus*, sp. n., and distinctly broader in proportion. *Prothorax* much more transverse, rather wider at the base and more narrowed in front, with the subapical constriction deeper; the dorsum less convex transversely and bearing an equally high stout wax process that also slopes forwards, but it is subconical in shape, the obtuse lateral flanges being as wide as the longitudinal ones; the small lateral processes much smaller than in *galeatus*; a transverse row of five very stout erect setæ on each side of the front margin, a similar row of four at about the middle, and several more setæ around the base of the median process. *Elytra* not longer than broad (without reckoning the humeral projections), almost flat from the base to the middle and there rather abruptly and very steeply declivous; at the top of the declivity a comparatively low (0·25 mm. high) wax ridge, nearly twice as long as high, running obliquely forwards from interval 2 to 5, with a short flange or buttress at the middle of its anterior side, the posterior side being rather deeply excavated; behind this a much lower transverse wax ridge running from interval 5 to 7, and the shoulders with a sharply angulate wax projection; the secretion less matted than in the two preceding species, being penetrated in many places by stout pointed erect white setæ.

Fig. 3.



*Cranopœus veitchi*, sp. n.

*Length* 1·8 mm., breadth 1·2 mm.

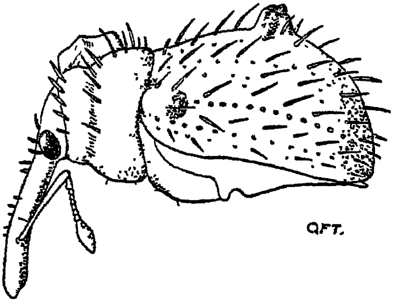
Fiji: Labasa, Viti Levu, 1 ♂, xii. 1921 (*R. Veitch*).

## *Cranopœus setiger*, sp. n. (Fig. 4.)

♂. Derm pale red-brown, with a comparatively thin powdering of grey secretion and with a row of ill-defined dark spots along the suture from near the base to the top of the declivity; the wax processes much smaller than in the preceding species.

*Head* with rather dense secretion which does not conceal the comparatively large frontal fovea, and with the usual erect ocular setæ. *Rostrum* longer than a front femur (0·75 mm.), nearly straight, subcylindrical, only slightly dilated at the apex and not compressed dorso-ventrally, with fine confluent punctation and a distinct median carina that includes a diamond-shaped fovea between the antennæ; the basal half with short erect setæ. *Prothorax* about as long as broad, widest at the base, subconical, with the sides almost straight and the postapical constriction comparatively shallow; the dorsum strongly convex transversely, bearing an arched longitudinal median wax process that does not quite reach the apex and ceases at one-fourth from the base, its height being only half its length, and the lateral flanges much reduced; no lateral processes; within the front margin a transverse row of ten long stout erect pointed setæ, those in the middle being the longest; a similar transverse row behind the constriction, and several long setæ on the median line behind the crest. *Elytra* of the usual form, slightly longer than broad (9 : 8), with the shoulders only slightly projecting laterally and obtusely rounded; the strongly punctate striæ visible through the secretion, and intervals 3 and 5 not more raised than the others and without basal tufts; behind the middle on each elytron a comparatively small, somewhat irregular, four-flanged wax process, which is as high as that on the pronotum; all the intervals (except 2, 4, 6 on the basal half) with a row of long stout

Fig. 4.



*Cranopœus setiger*, sp. n.

sharp erect white setæ, most of them higher than the dorsal processes.

*Length* 1·7 mm., breadth 1·0 mm.

Fiji: Rewa, Viti Levu, 1 ♂, 1905 (*F. Muir*).

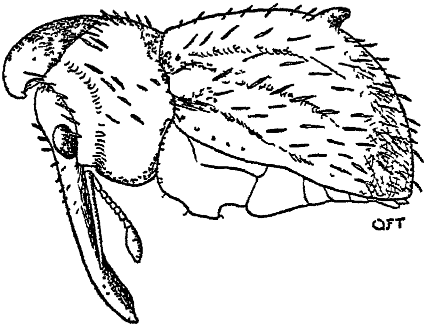
Readily distinguished by its small size and long erect setæ.

*Cranopœus marquesanus*, sp. n. (Fig. 5.)

♂ ♀. Derm red-brown, with the legs paler, covered fairly densely with a fine grey waxy secretion (sometimes with a brownish tinge), except on the rostrum, where the secretion is fulvous; the median crest on the pronotum and the small discal process on each elytron are also fulvous.

*Head* with short recumbent hairs, which are visible laterally even when the secretion is intact; no trace of a frontal fovea. *Rostrum* of ♂ about 1 mm. long, a little longer than a front femur, slightly dilated and dorso-ventrally compressed at the apex, with the usual minute confluent punctures and fine median carina bearing a diamond-shaped impression between the antennæ, and set with sparse stout erect setæ; rostrum of ♀ one-third longer and much more slender, with very fine sparse inconspicuous setæ, and entirely without secretion in the four examples seen. *Prothorax* (without the projecting crest) a little broader than long, rounded at the sides, widest behind the middle, gradually narrowing to the base where the angles project slightly, more strongly narrowed in front to the post-apical constriction, the apical portion being almost parallel-sided; the dorsum strongly convex transversely, bearing a median longitudinal crest in

Fig. 5.



*Cranopœus marquesanus*, sp. n.

the form of a simple arched lamina without lateral flanges (its height being about one-third of its length), starting about the middle of the pronotum and projecting well beyond the front margin for one-fourth to one-third of its own length, the lower edge of the projecting portion curving downwards somewhat like a beak ; no lateral wax processes ; an apical transverse row of six or seven stout erect setæ on each side, and similar setæ unequally scattered on the disk, especially at the sides and behind the crest. *Elytra* longer than broad (4 : 3), with the shoulders roundly rectangular and not projecting laterally and with no wax process, the sides gently sinuate behind the shoulders, widest behind the middle ; the striæ and punctures concealed by the secretion when intact, the former shallow and containing large round punctures ; intervals 3 and 5 distinctly elevated, the former bearing behind the middle a small simple arched wax ridge, somewhat similar to that on the pronotum but only of one-third the size or less and highest behind ; the alternate intervals each with a row of fairly long stout erect white setæ, and similar setæ on intervals 4 and 6 behind the middle.

*Length* 2·6–3·1 mm., breadth 1·4–1·6 mm.

Marquesas Is.: Fatu Hiva, 2000 ft., 9 ♂♂, 6 ♀♀, i. 1925 (*C. L. Collenette*).

This species differs from all its congeners in its forwardly projecting prothoracic crest. It is most nearly allied to the much smaller *setiger*, sp. n., from Fiji, from which it differs in its laterally rounded prothorax with its projecting basal angles, and in the proportionately much shorter setæ on the elytra.

As is probably the case in all the species of the genus, the wax processes vary considerably in development, and are evidently easily damaged when soft. The specimen figured appears to exhibit the normal full development of these peculiar excrescences.

## Subfamily *Cryptorrhynchinæ*.

### *Microcryptorrhynchus orbiculus*, sp. n.

♂ ♀. Derm shiny black, but appearing dull owing to a thin film of waxy secretion, with brown scales above, turning to grey on the sides and beneath.

*Head*, when scraped, shiny, with obsolescent punctures on the vertex, coarsely rugose at the sides and more finely so on the forehead, without any frontal fovea ; normally squamose and with a dense row of erect spatulate setæ along the eyes. *Rostrum* with two irregular rows of strong punctures on each side, nearly reaching the apex in ♂, shorter in ♀, and with four rows of erect spatulate setæ. *Antennæ* with the two basal joints of the funicle subequal, 3 and 4 equal and longer than broad, 5 and 6 as long as broad, 7 transverse. *Prothorax* somewhat transverse (3 : 3·75), strongly rounded at the sides, widest at about the middle, shallowly constricted at the apex, the constriction continued across the dorsum, the postocular lobes prominent; the dorsum gently convex longitudinally behind the constriction, with large reticulate punctures throughout which are visible through the clothing, the punctures on the pleuræ being similar to those on the dorsum; each puncture containing a large flat scale, leaving the interspaces bare; the apical area closely set with numerous stout erect clavate setæ, a sparser group of similar setæ in the middle of the disk and a few at the sides. *Elytra* almost circular (when viewed vertically from above) and with the declivity almost perpendicular near the apex, widest about the middle and there much wider than the prothorax (11 : 7), and truncate at the base; the punctures large and subquadrate, visible through the clothing though often filled with secretion; the intervals broader than the septa between the punctures and without granules, the alternate ones with rows of strongly spatulate erect setæ of varying density, but usually most numerous (and occasionally duplicated) on interval 3 and sparse and smaller on 7; the scales contiguous on the disk, but often separated towards the sides and apex, and usually covered with secretion. *Legs* with rather sparse brown scaling and rows of erect pale clavate setæ; tibiæ with the uncus definitely situated at the outer apical angle and separated by about its own length from the sharply acuminate inner apical angle; tarsi not paler than the tibiæ. *Sternum* with a very dense patch of scales on the metepisterna; the terminal receptacle of the mesosternum and the middle of the metasternum set with long narrow erect setiform scales. *Venter* coarsely punctate, each puncture bearing on its anterior edge a broad spatulate suberect seta; the basal ventrite not impressed in ♂.

*Length* 2·1–3·6 mm., breadth 1·3–1·6 mm.

Marquesas Is.: Hiva Oa, 3000–3500 ft., 19 ♂♂, 3 ♀♀, xii. 1924–i. 1925, beaten from pepper-trees (*C. L. Collenette*).

The unusually rotund elytra will distinguish this insect from any of the previously described species in the genus.

### *Microcryptorrhynchus collenettei*, sp. n.

♂ ♀. Nearly allied to *M. orbiculus*, sp. n., and differing as follows:—

*Head*, when denuded, finely and very sparsely granulate, less rugose laterally. *Antennæ* with the funicular joints rather more elongate, 5 and 6 being a little longer than broad. *Elytra* distinctly more elongate, broadly ovate, more acuminate behind, widest before the middle; the intervals with minute low granules (hardly visible unless abraded), much more sparsely squamose, and 2, 4, 6 also with erect or suberect shorter spatulate setæ. *Legs* with the tarsi usually paler than the tibiæ. *Sternum* with the mesosternal receptacle set with much broader subrecumbent scales. *Venter* with the punctures distinctly smaller and the setæ narrower.

*Length* 2·1–2·7 mm., breadth 1·1–1·4 mm.

Marquesas Is.: Hiva Oa, 3000–3500 ft., 12 ♂ ♂, 9 ♀ ♀, xii. 1924–i. 1925, beaten from pepper-trees (*C. L. Collenette*).

### *Microcryptorrhynchus planiceps*, sp. n.

♂. Similar in facies to *M. collenettei*, but differing from both the preceding species in the following characters:—

*Head* markedly flattened, so that there is a gap between it and the front margin of the pronotum; the vertex covered with opaque secretion and with a few small setæ, but when scraped smooth, shining and impunctate even at the sides; the forehead coarsely punctate, without the lateral rows of erect setæ, but with a deep stria adjoining the eye (hidden by secretion), and the inner margin of the eye slightly raised into a narrow carina. *Antennæ* more elongate, all the funicular joints much longer than broad, and the setæ much longer proportionately. *Legs* longer and more slender; the uncus of the tibiæ less curved, but sloping obliquely inwards so that its base merges with the inner apical angle, which is not acuminate.

The broadly ovate elytra are abraded in both the specimens available, but the rows of erect spatulate setæ are apparently confined to intervals 1, 3, 5, 7, and the intervals are sparsely and minutely granulate. The two basal ventrites are coarsely and reticulately punctate, and ventrite 1 is broadly impressed in the middle.

*Length* 2·8–3·1 mm., breadth 1·5–1·7 mm.

Marquesas Is.: Hiva Oa, 3500 ft., 2 ♂ ♂, i. 1925, beaten from pepper-trees (*C. L. Collenette*).

## LXI.—*Notes on the Biology of Spiders.*—IV. *Further Notes on Aquatic Spiders, with a Description of a new Species of Pseudoscorpion from Singapore.* By W. S. Bristowe, B.A., F.Z.S.

Spiders are essentially landlubbers, but some can float safely over the sea by means of silken parachutes, whilst others trespass on the fringe left exposed at low-tide. Some, like *Desis*, retire into a chamber before the sea returns. There are others which approach so closely to its borders that they run a severe risk of destruction in seasons when the tide is exceptionally high. Doubtless many are destroyed, but there are some who by accident or design live to have their story told. From the mangrove-swamps of Malaya Abraham has described a burrowing Mygalomorph spider which lives secure, and with an abundant air-supply, by simply closing the tightly-fitting door with which the burrow is provided *. I have shown that when the mud-flats round our coast are invaded by the sea there may be some that fly before it or are engulfed, but that one species at least, a little *Lycosa*, remains where it is or dives beneath the surface with a supply of air clinging to its hairy body to last it till the sea retreats †. This little *Lycosa* has relations that extend on to the sea-shore, and one of these, a common species called *Lycosa pullata*, Clerck, may be seen running amongst the pebbles piled up by the sea above the stretches of sandy shore round our coast. Lying idly amongst these pebbles at Cooden Beach I have frequently watched the Lycosæ disporting themselves. I have noticed, for instance, that in spring they are all busily engaged in a search for flies and other suitable game, that in early May first the males and then the females cast their skins and divide their attention between courtship and food-supply, that towards the end of the month eggs contained in a bluish or brownish cocoon are attached to most females' spinnerets, and by about the middle of June the young have hatched and are clinging on to their mother's back. It is during the first two weeks in June that the males suddenly vanish—they die of senile decay, I believe, in this species, and not as a result of female wrath or hunger. These dates, of course, are not applicable to the whole of Great Britain, and the females are still carrying their eggs in the fourth week of July in the Shetland Islands, a month or six weeks later than at Cooden.

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* *Idioctis littoralis*, Abr., *vide* Proc. Zool. Soc. 1924, p. 1098.

† *Lycosa purbeckensis*, F. Camb., *vide* Ann. & Mag. Nat. Hist. ser. 9, vol. xii. p. 154 (1923).

But to revert to the habits of this little spider on the beach at Cooden: what does it do when the sea exceeds its usual limits and covers the *Lycosa's* hunting-ground? Does it nestle down amongst the pebbles and allow the water to cover it like its mud-flat relation? Surely the pounding of the waves and the movement of the pebbles would grind its fragile body to pieces. Besides, it is no specialist of sea-shores. It is our commonest and most widely-distributed Lycosid, and you will find it in sheltered woods and fields, in swamps and heath-land, as well as on wind-swept downs and mountain slopes.

On May 2nd, 1931, the tide was an exceptionally high one, and I was able to satisfy myself that it does not expose itself to this risk. As the tide rises the *Lycosa* retreats. When a wave washes further up the shore than its forerunners and overtakes a *Lycosa,* it lies quite still and floats on the surface until the wave is spent and the water runs back to the sea. On these occasions it makes no movement until a pebble is touched, when it takes its opportunity and climbs on to it. There it pauses, as though to let the water drain away from round its pedestal, and then runs back to safety amongst the dry stones. An interesting point is that it always runs in the right direction. How does it know which way to run? Fifty times I put spiders where the sea caught them up, and every single time they ran in the right direction after they had come to rest on a stone. On a few occasions they started in a wrong direction, but in each case curved their course until it was directly away from the sea. With great care I turned round the stone on which they were resting, on the chance of confusing their sense of direction, but this made no difference. They could not have taken their bearings from the sun, for this was entirely obscured by clouds, and they could not have been retracing their tracks by scent or other means, as they had floated there like a cork on the top of the water; nor could it be by the direction in which the water was draining back to the sea, for in all cases it had sunk well below the level of the stones before the homeward journey was made, and the turning of the stone on which they stood made no difference.

Perhaps it is due to their ability to see the sea, for the sight of Lycosids is second only to the Attids amongst spiders, and they can see moving objects at a distance of several feet. A screen was placed between the spider and the sea, and the stone on which one alighted slightly turned —no, still the spider ran in the right direction. Next I dug a big crater-like hole with gently sloping sides amongst the beach pebbles, and set free spiders one after another into it. Those that alighted on a side always ran upwards from that point directly away from the centre of the crater. Those that were placed right in the centre took a north, south, east, or west course quite indiscriminately. The most obvious explanation is not always the first to occur to one, and in this case they always run away from the sea because the beach happens to slope away from it. All collectors of spiders must have noticed how those placed under a glass tube will always attempt to run up it; how ground-living spiders liberated in a box of large dimensions and provided with soil etc. to make them feel "at home," will always start by running across the level ground and attempting to climb up the sides, whether they be glass, wood, or cardboard; how spiders dislodged by lifting heather or other vegetation growing on a bank will always attempt to escape *up* the bank. Now we have started along this train of thought, why do *these* spiders run upwards? It may satisfy us to find that the shore *Lycosa* runs up the beach—it seems to be common-sense,—but why does a spider pursued by man run up a bank when it might escape at twice the speed by fleeing in the opposite direction? The answer to this is that spiders have not got common-sense, and that their actions are governed by instinct. I would suggest that water—floods more particularly than the sea—destroys a great number of spiders, that those spiders which run up slopes or vegetation stand a greater chance of survival, and that ultimately this instinct to run uphill when in danger has arisen through natural selection; being blind rigid instinct, the spider responds to it whether the pursuer be water, man, or other foe.

The rising of the tide to higher levels than usual is similar in effect to the occurrence of floods inland, only in the latter case much more life is disturbed. Some Lycosids, in addition to the mud-flat species and various spiders belonging to other families*, can and do escape their enemies by running down vegetation under the surface of the water (*Pirata piscatoria*, Clerck), but the bubble of air that automatically collects round their bodies will only last a matter of hours; so, unless they come to the surface to renew their supply, and there is no evidence to show that any spider except *Argyroneta aquatica* has learned to do this, they will die. In point of fact, my observations in floods tends to show that spiders attempt to escape (1) by climbing to the top of grasses and other vegetation, (2) by ballooning, and (3) by running over the surface, which Lycosids and various other spiders can do without discomfort, to dry land. Some spiders are entrapped under the stone beneath which they live, but if the stone is uneven a variable supply of air will remain behind which may or may not last them until the water subsides. It is surprising how little air spiders really breathe. In experiments on my mud-flat spiders I found that one bubble lasted as long as ten hours, whilst a male *Argyroneta aquatica* lived through the winter from October to February, presumably with at least partially suspended animation, without renewing the supply of air contained in its cell. In July 1930 I found some *Clubiona holosericea*, De Geer, at Kirkwall (Orkneys) enclosed in dense silken cells attached to the underside of stones the tops of which were only just appearing above the surface of the lake, which had overflowed its ordinary boundaries. Many spiders are destroyed by floods, but not without a struggle, and, thanks to the various devices mentioned above, a good proportion survive, in addition to the majority of eggs, which are packed securely in impervious silk cocoons.

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* *Vide* my earlier papers: "A British Semi-marine Spider," Ann. & Mag. Nat. Hist. vol. xii. 1923, p. 154; "The Spiders and Harvest-men of Wicken Fen," forming a section of pt. ii. (1925) of 'The Natural History of Wicken Fen.'

Just after I had completed a note about aquatic spiders, in which I discussed the marine *Desis* and the pitcher-plant spider, *Misumenops nepenthicola*, Poc.*, which descends into the plant's digestive fluid when alarmed, an opportunity arose for me to visit Malaya, where both are to be found. In that paper I called attention to the fact that Pocock, who outlined the habits of this *Misumenops* as long ago as 1898, and gave it a name, never published a description. For this reason I added some drawings, but I now find that Fage noticed the same omission two years previously, and published an excellent description in the 'Malayan Branch of the Royal Asiatic Society,' vol. vi. August 1928. In May 1930 he followed this by a second paper ('De Treubia,' vol. xii. May 1930, p. 23) recording two further pitcher-plant spiders—*Theridion decaryi* and *Thomisus nepenthiphilus*—from Madagascar and Sumatra respectively. The latter resembles the *Misumenops* in habits, in that it seeks refuge beneath the surface of the plant's liquid when disturbed.

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* Ann. & Mag. Nat. Hist. p. 343 (Sept. 1930).

In the course of my stay in Malaya I caught *Misumenops nepenthicola*, Poc., *Desis martensi*, L. Koch, and *Diplocanthopoda marina*, Abr., the marine Attid described by Abraham in 1926[*]. I also found a new species of Pseudoscorpion in similar situations to those frequented by *Desis* at Singapore, which I describe at the end of the present paper.

*Desis martensi*, L. Koch, is probably found in all suitable situations round the Malay Peninsula. It is not restricted to coral-reefs, but also occurs under stones between tide-levels. It has now been found at Port Dickson, Singapore, and two islands a few miles distant (Blakang Mati and Pulau Renggis), Pulau Aor on the east coast, and Pulau Pisang, an island to the south of Singapore. At low-tide it runs rapidly about in search of prey, investigating every hole and cranny[†], but it was some time before I saw one make a capture. In the course of its wanderings one of them came upon a small Ocypodid crab. This it pounced upon and bit several times before dragging it to the nearest hole, into which it disappeared with its burden. Later I saw one catch a small orange Amphipod, identified by Mr. Smedley, of the Raffles Museum, as *Orchestia platensis*, Kröyer. *Desis* is abundant in these situations, and no wonder, for food is abundant and enemies few. There are, for instance, Isopod Crustacea, worms, mites, Collembola, "water-skaters," Coreid (?) bugs, Staphylinid beetles, and Empid flies all frequenting the same habitat at low-tide, in addition to the two Arthropods I saw it catch. Mr. Smedley tells me that one of his collectors found a small species of octopus (body 1½ inches, tentacles 5 inches) eating a spider (presumably *Desis*) on Pulau Pisang Island.

Since the Attid *Diplocanthopoda marina*, Abr., described by Abraham from Port Dickson, was fairly abundant on Singapore and the little island adjoining it of Pulau Renggis, it seems evident that this is the "*Attus*" seen by Dr. von Martens on the Singapore reef in 1861, when he discovered *Desis martensi* for the first time. It appeared to me that *Diplocanthopoda* did not extend so far below high-tide level as *Desis*, but it can be seen jumping about at low-tide on the rocks below the high-tide mark.

Since accounts as to the powers of *Desis* to dive under or run about on the surface of the water differ, I carried out a few experiments, and found that neither *Desis* nor *Diplocanthopoda* could be persuaded to descend beneath the surface. Both can run over the surface with ease, and are provided with long hair on their legs which facilitates this. I believe that both spiders retire to a suitable cranny as the tide comes up, and weave a silken cell enclosing enough air to last them until it retreats again. On the other hand, Mr. Robson, the finder of the Australasian species *D. marinus*, Hector, states very definitely that that species is quite at home beneath the water, and will catch small fish [*].

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[*] Proc. Zool. Soc. pt. 4, 1925, p. 1357.

[†] The long jaws extending horizontally in front of it are very suitable for grappling with a worm or other creature living in a burrow.

Fig. 1.

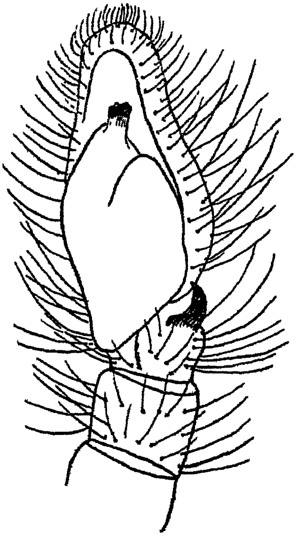
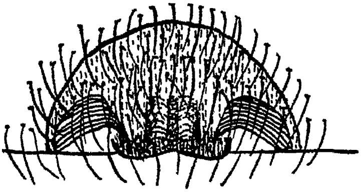


Fig. 2.



*Diplocanthopoda marina*, Abr.

Fig. 1.—Male palp.
Fig. 2.—Female vulva.

There is great variation in the size of the *Desis* males, and, as in the case of our British water-spider, *Argyroneta aquatica*, the male is frequently as big or bigger than the female. The large specimens have cheliceræ which are larger in proportion to their size than in the smaller males. Mating appears to take place mainly in the late summer months. On coming in contact with a female the male opens his jaws and spars with her. Then, if she does not evade him, he grips her cheliceræ with his own, and, sliding round to one side, endeavours by sideways pressure to pivot her on to her back. This accomplished, he looses his grip and advances until he can reach her vulva with his palps. Standing sternum to sternum, and facing in an opposite direction to her, first one palp is inserted for one minute, and then the other for about a minute and a half. After removing this he creeps away.

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[*] *Vide* R. I. Pocock, Proc. Zool. Soc. 1902, vol. ii. no. xvii. p. 101.

The thirty to fifty yellow eggs that the female lays are enclosed in a thick, soft, white cocoon, and the young spiders stay with her for some time after hatching, probably until after the third moult.

Since Abraham was only in possession of females when he described *Diplocanthopoda marina*, I give below figures of the male palp and also of the female vulva, which is very difficult to see and not clearly defined in his drawing. In general appearance and size the male resembles the female.

*Misumenops nepenthicola*, Poc., is common at Singapore, and has been recorded from Borneo and Sumatra. The three main species of pitcher-plant in Singapore are *Nepenthes gracilis*, Korth., *N. raffesiana*, Jack., and *N. ampullaria*, Jack. According to C. Dover's observations the spider was restricted to the first of these ('Malayan Branch of the Royal Asiatic Society,' vol. vi. pt. iii. 1928), and he states that the digestive fluid is less strong in this than in *N. ampullaria*. There is, however, another good reason for this preference. In *N. gracilis* the glandular cells leave off abruptly halfway up the pitcher, whilst in *N. ampullaria* they extend to the top. *N. raffesiana* is intermediate, as the cells diminish in size as the pitcher is ascended. One would hardly expect the spider to appreciate being in constant contact with the digestive fluid, so its choice of *N. gracilis*, where it can sit above the gland-cells, seems natural. In the course of my search I found a *Misumenops* in about one out of every five *N. gracilis* examined, a few in *N. raffesiana* pitchers, and none in *N. ampullaria*. In all cases the spiders sat inside the pitchers, and I saw them deprive the plant of its prey by catching flies that had entered. Such insects as ants, however, which it does not like, it flicks into the plant-fluid with its legs, and I did not see it extract any insect once it had been immersed in the fluid. It does not like the flavour of the fluid, as is shown by the way in which it carefully dabs its mouth against the pitcher-wall after it emerges from a visit below the surface.

If the spider is disturbed it invariably slides down into the liquid, and will remain there for several minutes. The

Fig. 3.

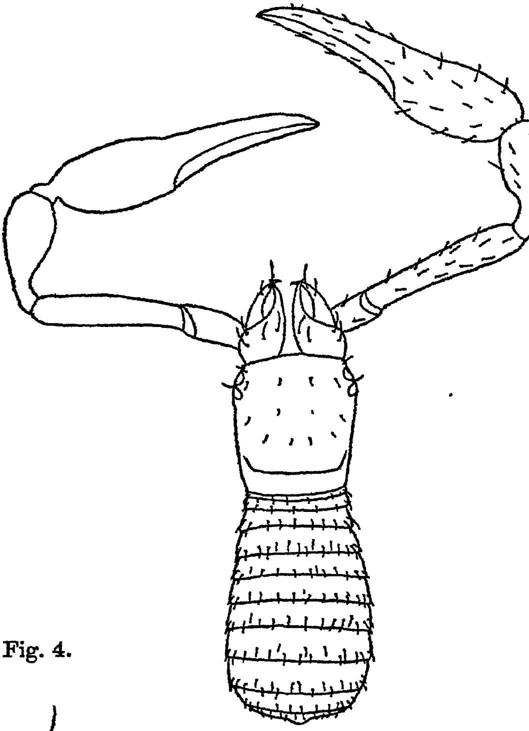


Fig. 4.

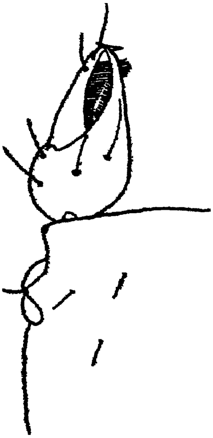


Fig. 6.

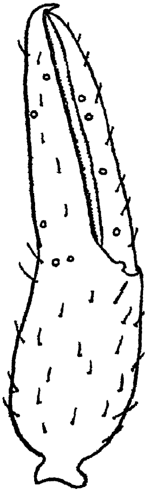
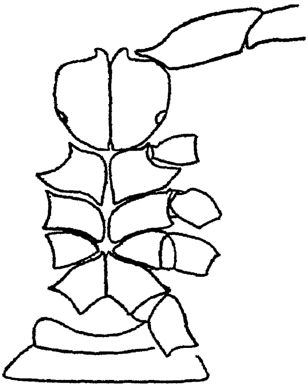


Fig. 5.



*Obisium submersum*, sp. n.

Fig. 3.—General appearance (without legs).
Fig. 4.—Left cheliceræ and eyes.
Fig. 5.—Coxæ from beneath.
Fig. 6.—Claw, from outside, showing small clear spaces.

first question that naturally occurs to one is, How does it breathe? I noticed in the first place that its book-lungs protrude somewhat prominently when it is submerged, so that they hold more air than is necessary for its immediate requirements, and that the lower surface of the abdomen is provided with pubescence, in contrast to the upper surface, which is smooth except for a few small spines. This pubescence automatically entraps a small bubble of air, which is restricted, of course, to this surface. The strongly chitinous nature of the upper surface serves as a protection against the digestive fluid of the plant. Thus the spider is adapted in these respects to the life it leads. When freshly caught the spiders vary in colour from light pink to dark red, almost black.

## Description of the new Semi-marine Pseudoscorpion.

### *Obisium submersum*, sp. n.

*Length* 2 mm.

*Colour.*—Pedipalps and thorax reddish brown, abdomen brown, legs pale cream.

*Eyes.*—Two groups of two rather large eyes placed laterally. Viewed from above a prominence terminated by a stiff bristle appears to separate them (see fig. 4).

*Cephalothorax.*—Shiny and clothed with a few hairs only. Broadest anteriorly in the ocular area, and tapering gently backwards, 1¼ times as long as broad.

*Abdomen.*—About 1½ times as long as the cephalothorax. Broadest near posterior end. Anterior half of each segment darker in colour than posterior half, which alone is clothed with a few stiff hairs.

*Cheliceræ.*—Large curved falces. Hinged falx provided with four teeth and a row of stiff bristles longest anteriorly. The tip of the falx is curved sharply almost at right angles. The immovable falx has a series of small rounded knobs or teeth, and is also provided with bristles. The cheliceræ have a few long hairs.

*Pedipalps.*—1¼ times as long as the body. A few scattered hairs. Claw 1½ times as long as palm. Palms not very swollen. Fig. 6 shows clear spaces and curved tip to immovable finger. Cubital joint narrows sharply posteriorly.

*Habitat.*—Several specimens found in similar situations to *Desis martensi*, under stones below tide-level at Singapore and on the little island of Pulau Renggis adjoining Singapore.

*Types* in the British Museum.

## LXII.—*Notes on the Biology of Spiders.*—V. Theridion ovatum, *Clerck, its Habits and Varieties.* By W. S. Bristowe, B.A., F.Z.S.

One of our commonest and most widely distributed spiders in Great Britain is *Theridion ovatum*, Clerck (= *Phyllonethis lineata*, Clerck). Amongst shrubs and herbage it builds a little web composed of irregular strands of silk crossing one another at all angles, and by sweeping in meadows amongst grass, nettles, ragwort, and Umbellifers, or beating bramble-bushes, we can be tolerably sure to find it. In late June and July it becomes adult [*], and in July and August the female constructs a retreat by curling a suitable leaf prior to laying her eggs. By far the most popular leaves are brambles, but I have also found it making use of elm, maple, hazel, ash, beech, willow, oak, may, nettles, Umbellifers, *Convolvulus*, and other herbs, and even gorse. The eggs are enclosed in a neat round covering of blue silk. On rare occasions (once in 250) a second and smaller cocoon of similar appearance is produced later. Sometimes a single curled leaf houses two or three spiders, each enclosed in their separate silken cells. The mother stays with her young ones after they have hatched and until they disperse. You will often find her looking very emaciated still in her self-made prison in October, and frequently she dies at her post. It is not rare to see a neat hole drilled in the bramble by some bird that has learned that the *Theridion* is a tender morsel, and without her protection the eggs soon fall a prey to earwigs that enter by the same hole of destruction. Sometimes Hymenopterous parasites get at the mother and/or the eggs in spite of her ceaseless vigil. I have, for instance, bred a male and a female Ichneumon, *Polysphincta multicolora*, Orav. Whether spiders sometimes become egg-bound or not I am uncertain, but sometimes I have found pregnant females of this species, of *Micrommata virescens*, and other species dead, and the corpse limp and flaccid. On one occasion at Bexhill, where *T. ovatum* had died of this or some other disease, I found scavenging Phorid fly larvæ feeding on the remains. These I bred out, and I am indebted to Mr. O. W. Richards for identifying them as *Aphiochæta rata*, Wood. A very long white Nematode worm that emerged from the abdomen of a female kept in captivity by Mr. G. H. Locket has been identified as *Mermis* sp.*.

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[*] I have described the mating-habits elsewhere (Proc. Zool. Soc. pt. ii. 1929, p. 317).

*Theridion ovatum* has three colour-variations, and breeding experiments to decide whether these represent some Mendelian character would be well worth the trouble. In one the abdomen is light cream or white, in the second there is a bright red band passing along each side, and in the third the whole upper portion of the abdomen is bright red. Calling these varieties white, stripe, and red respectively, counts made in ten different counties have given 2369 white, 1201 stripe, and 181 red out of a total of 3741. That the white variety is the predominant one is clear to anyone who does extensive collecting, but the exact proportions appear to be by no means constant, as the detailed figures given on p. 468 will show. The Scilly Islands are exposed to wind, and there my collection contained four times as many whites as reds. Collecting amongst marram on the sand-hills near Penzance the proportion was 3 : 1. Perhaps climatic conditions are the deciding factor after all, I thought, but then I found that my collection in the morning at Brockenhurst gave me the following result, 437 : 281 : 7, and in the afternoon, in identical situations not a quarter of a mile distant, 232 : 4 : 41 ! † These figures would appear to be governed by something more than chance working with similar proportions of each variety, and heredity would satisfactorily explain the relatively high proportion of one variety in a given restricted area.

In spite of its flimsy appearance *Theridion ovatum* is an intrepid warrior. If an insect which comes to sip the honey of the ragwort, Umbellifer, or other flower beneath which a *Theridion* is lurking happens to touch one of its threads the spider in an instant hurls viscid threads at it with its hind legs. It does this regardless of the size of the insect, and I have watched numerous battles in which the spider was ultimately victorious over flies many times its own bulk (*Calliphora vomitaria*, Linn., *Eristalis tenax*, Linn.) and small bees such as *Halictus cylindricus*, Fab.

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* I am indebted to Dr. Baylis for the identification. He tells me that these worms, which parasitize insects, reach maturity, after leaving their host, in the damp soil. They either enter by means of the mouth or else by clinging to the host and boring through the body-wall—as would be the case with a spider. Dr. Baylis has one other record of a spider as host—a South African *Lycosa*. Menge records *M. albicans* from the water-spider *Argyroneta aquatica* (Preussische Spinnen), and McCook a worm (that he calls *Gordius*) from *Lycosa rabida*, Walck. (=*L. scutulata*, Hentz). ("American Spiders and their Spinning Work.")

† The results of counts carried out by E. Nielsen (1) in his garden at Copenhagen and (2) at Gudhjem were as follows:—(1) 55 white, 34 stripe, 10 red; (2) 19 white, 31 stripe, 6 red ('De Danske Edderkoppers Biologi').—N.B. One morning's collection at Bexhill gave me rather similar results to (2), *i. e.*, 168 white, 191 stripe, 39 red (=proportions 28 : 32 : $6\frac{1}{2}$).

| Localities *. | White. | | Stripe. | | Red. | | Total. |
|---|---|---|---|---|---|---|---|
| | No. | %. | No. | %. | No. | %. | |
| Suffolk—Thorpeness | 86 | 51·49 | 71 | 42·52 | 10 | 5·90 | 167 |
| Cornwall—Penzance | 47 | 72·31 | 16 | 24·62 | 2 | 3·07 | 65 |
| Scilly Is. | 298 | 78·63 | 75 | 19·79 | 6 | 1·58 | 379 |
| Devon—Bideford | 187 | 74·21 | 57 | 22·62 | 8 | 3·17 | 252 |
| Budleigh Salterton | 50 | 54·95 | 37 | 40·66 | 4 | 4·39 | 91 |
| Lundy Is. | 56 | 83·59 | 11 | 16·41 | 0 | 0 | 67 |
| Hants—Brockenhurst | 669 | 66·75 | 285 | 28·45 | 48 | 4·80 | 1002 |
| Sussex—Bexhill | 580 | 50·70 | 508 | 44 40 | 56 | 4·90 | 1144 |
| Kent—Littlestone | 22 | 68·75 | 10 | 31·25 | 0 | 0 | 32 |
| St. Margaret's | 124 | 54·39 | 77 | 33·78 | 27 | 11·83 | 228 |
| Surrey*—Cobham | 9 | 75·00 | 2 | 16·67 | 1 | 8·33 | 12 |
| Brecon—Brecon | 54 | 87·08 | 6 | 9·68 | 2 | 3·24 | 62 |
| Carmarthen—Llandovery | 104 | 73·24 | 23 | 16·20 | 15 | 10·56 | 142 |
| Monmouth—Abergavenny | 73 | 74·49 | 23 | 23·47 | 2 | 2·04 | 98 |
| Total | 2369 | 63·3 | 1201 | 32·1 | 181 | 4·8 | 3741 |

Sometimes a commotion in an adjoining web belonging to another spider attracts its attention, and it does its best to poach the prey. Allied species do likewise, and on one occasion whilst two *T. pictum* were sparring over a struggling insect a *T. ovatum* quietly ran off with it. Twice I have seen it sitting in the webs of *Linyphia triangularis*, Clerck (Worthing and Lundy), and once in the web of a *L. montana*,

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* Since going to press the following addition has been made: Chobham, 30:18:5.

Clerck (Woking), calmly eating an insect, whilst the owners (which, like all Linyphiæ, were cowards) had retreated to a safe distance until it retired. I recently watched another relation, *T. sisyphium*, carrying on a lengthy combat with the relatively enormous *Agelena labyrinthica*, whose web it had invaded in an attempt to wrest some succulent tit-bit from its clutches (*vide* " A Contribution to the Knowledge of the Spider Fauna of South-West Ireland," Proc. Zool. Soc. pt. i. 1931, p. 17).

*Theridion ovatum* is a very common spider whose habits have never attracted anyone's serious attention.

## LXIII.—*Notes on the Biology of Spiders.*—VI. *Spitting as a means of capturing Prey by Spiders.* By W. S. Bristowe, B.A., F.Z.S.

The house-fly regurgitates its food as a digestive measure, and Eastern cave-swifts (*Collocalia*) are famous for the little nests built of half-digested seaweed that are esteemed so highly as articles of diet by the Chinese; but neither the fly nor the bird spit in the usual sense of the word. Some animals spit in self-defence and others as a means of capturing their prey. Under the former category we might include the South American llama, wild cats, termite soldiers which spit out an irritating gummy fluid, and Holothurians, or sea-cucumbers, that part with their whole stomach and then proceed to grow a new one. The East is well represented with animals that spit primarily as a means of capturing prey. There are, for instance, the spitting fishes of the genus *Toxotes* found in Siamese, Malayan, and East Indian waters, which knock insects into the water from overhanging branches by this means. There is the snake, *Naia sputatrix*, in similar localities, which is said to be capable of causing inflammation and perhaps temporary blindness of its enemies' eyes by spitting at them from a distance of eight or ten feet. And, thirdly, there is the worm-like Arthropod, *Peripatus*, also found in these countries, which naturalists state ensnares insects by spitting a gummy secretion at them. Thus the habit is found in several widely separated classes of animals, although the process is not homologous in each.

During the course of a visit to these same countries I found that spiders of the Family Sicariidæ also capture their prey by spitting a gummy secretion with poisonous properties at them, and in a lecture I gave to the Natural History Section of the Siam Society in Bangkok on January 15th, 1931, I recorded this observation made on four different species of this family in Malaya and Siam*; but on my return to England I found that an Italian naturalist† had seen the same thing two years previously ‡. His observations on *Scytodes thoracica,* Latr., have been confirmed by Dr. I. Millot, of Paris, and supplemented by two able papers by that author §, in which his careful histological work is described.

My observations were made on *Scytodes venusta,* Thor., *S. marmorata,* L. K., *S. domesticus,* Dol., and an undescribed Sicariid collected in the Batu Caves near Kuala Lumpur, and they agree closely with what has been written by Monterosso and Millot. At a distance of about a quarter to half an inch the spider gives a convulsive jerk of its entire body, and the next thing one sees is that the insect is in difficulties. Under a microscope it was found that the insect was securely stuck to the ground and entangled by parallel bars of viscid gum. These bars, which vary in number from ten to twenty, are probably formed according to some law of surface tension. They are at right angles to the longitudinal axis of the spider. I have seen this ejaculation of gum on at least fifty occasions, but so rapidly did it take place that I could not satisfy myself as to whether the gum emanated from the mouth or the fangs. Dr. Millot's dissections show conclusively that the glands open out into the cheliceræ. On several occasions I noticed that the insects died as a result of contact with the fluid; some small nematocerous flies died within a quarter of a minute, but in other cases the effect was much slower and did not always result in death. This also is explained by Dr. Millot's work, for he shows that the size of the glands in different individuals of the same age and species vary markedly. Monterosso did not observe the poisonous properties of the gum ; Millot, on the other hand, not only saw the poisonous effect, but also conclusively showed, by making sections of the cephalothorax, that the large glands which exist are partially subdivided and that one division contains a gummy and the other a poisonous fluid. This discovery is an interesting confirmation of the theory that the spinning-glands of certain Arachnids, such as the Pseudoscorpions, and the poison-glands of spiders is homologous. I made this suggestion in my lecture to the Siam Society, and Dr. Millot deals at some length with the same conclusion. The Sicariids are a primitive family in many respects, and here we have a transition from the one function to the other. Dr. Millot shows that in the genus *Scytodes* the poison- and gum-producing glands are both present, but in the genus *Loxosceles* the latter are wanting or vestigial.

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* An account of the lecture was published in the 'Bangkok Times and the 'Siam Observer' on Jan. 15th, 1931.

† M. Monterosso, Arch. zool. Ital. vol. ii. p. 63 (1928).

‡ Prof. Gerhardt has noticed that the male spits at the female before mating (Zeit. Morph. Oekol. Tiere A, 1926).

§ C. R. Acad. Sc. Paris, Juillet 1929, p. 119; Bull. de la Soc. Zool. de Fr. lv. 1930, p. 150.

Spiders of the family Sicariidæ are restricted to the warmer parts of the world, and the species on which Monterosso and Millot have experimented, *Scytodes thoracica*, Latr., is a Mediterranean one. There it is found under stones, and I have taken it in abundance in such situations in Majorca, but further north it is rare and takes to living in houses. It has been found on rare occasions in southern England, Oxford (twice) being its most northerly record, and Dorset being the county in which most specimens have been taken (Studland, Bloxworth, Weymouth). The Rev. J. E. Hull tells me that he was sent no less than twelve specimens from Studland a few years ago. It has also been recorded from Guernsey, Dover, Tunbridge Wells, and Hastings. The Sicariids are nocturnal in habits, their movements are slow, and their jaws small, so that arachnologists have wondered how they ever managed to catch or overpower anything. Now we know.

## LXIV.—*Notes on the Biology of Spiders.*—VII. *Flies that triumph over Spiders.* By W. S. Bristowe, B.A., F.Z.S.

"'Will you walk into my parlour,'
Said the Spider to the Fly."

Although flies must be looked upon as being the staple diet of spiders, there are some that never or scarcely ever eat flies. Many of the Linyphiids probably subsist mainly on Collembola, although small Nematocerous flies are certainly captured as well; but the Drassids (*Drassodes* and *Zelotes*) will usually refuse flying insects and feed on the crawling forms of life that they meet with under stones and at the roots of herbage. This is the first rebuff to popular belief, but there is much more to follow, for some flies play with spiders, if we may be permitted to use an anthropomorphism, others share house with them, some parasitize them or their eggs, and yet others actually attack and eat them!

In Ceylon, India, and Malaya I have frequently seen rows of long-legged Tipulid flies (*Thrypticomyia* sp.) hanging by their two front legs on the stay-lines of Epeirid spiders' webs, like washing hung out to dry on a clothes-line; and in England I have seen Cecidomyiids behaving somewhat in the same fashion. Mr. F. W. Edwards tells me this has also been recorded for W. Africa, and that in England he has found the mosquito, *Theobaldia morsitans*, making similar use of spiders' webs. The stay-lines of the web are not sticky, and the flies take to flight if they are disturbed; so it would appear as though this is simply a case of their finding it to be a comfortable resting-place.

On one occasion at Cobham I saw *Scatophaga stercoraria*, Linn. (Cordyluridæ), the common dung-fly, sitting in the web of *Epeira diademata*, Clerck, the garden spider, and sucking the juices of an insect which had been wrapped up by the spider. This stealing from Epeirid spiders' webs is also resorted to by wasps. In England I have seen *Vespa vulgaris* drag a struggling fly out of the web of *Epeira diademata* before the owner had time to get there; and in Malaya, near Kuala Lumpur, I have seen a Crabronid carefully examining the small flies caught in the giant web of *Nephila maculata*, giving each a little tug, and finally pulling one free by force and flying off home with it.

Flies have been seen sitting on the backs of spiders, and the explanation of this habit is not so clear. In a letter (29. x. 28) Mr. J. E. Collin writes:—"In some cases riding flies acquire the habit because they get a lift to some substance upon which to lay eggs. For example, *Limosina sacra* and *L. equitans* riding on Dung Beetles." This may be true for certain flies, but others choose this dangerous seat with food and/or parasitism in view. H. Kramer (Abh. Naturf. ges. Görlitz, 1917, p. 348), for instance, records finding a white spider (almost certainly *Thomisus onustus*, Walck., or *Misumena vatia*, Clerck) sharing its meal of a dead hive bee with some Milichiid flies, *Desmometopa sordida*, Fall., and Mr. O. W. Richards tells me he has seen the same thing. In his case the spider was definitely *Thomisus onustus*, Walck., and the fly probably *D. sordida*. The flies of this family have frequently been seen sitting on the backs of spiders, waiting, it would seem, in the light of these observations, until the spider catches an insect (see McCook, 'American Spiders and their Spinning Work,' vol. i. p. 256: "Many small flies sharing the food of *Argiope aurantia*, Luc. (=*A. cophinaria*) and sitting on her back").

In 1927 Mr. G. L. R. Hancock sent me a large Epeirid spider, *Cyrtophora* sp., from Uganda, on whose back he had found considerable numbers of small (1 mm.) black Chloropid flies of the genus *Gaurax*. It would appear as though parasitism was here their purpose, for flies of this genus, of *Siphonella*, *Oscinella*, and *Trimerina* have been bred from the egg-cocoons of spiders (Coquillet, Bull. 10, New Series, Div. of Ent. U.S.A. 1898, and Proc. U S. Nat. Mus. xxii. p. 265). The *Cyrtophora* was gravid, though whether the flies were aware of this is difficult to say.

The family Acroceridæ appear to specialize on the parasitism of spiders and their eggs. The fly, it is said, lays eggs on stems of plants or other appropriate places, and the larva finds the spider or the eggs itself. Brauer has described the habits of a European species, *Astomella lindeni*, which he bred from a trapdoor-spider, *Cteniza ariana* (Verh. Ges. Wien, xix. 1869, p. 737), Emerton of an American *Acrocera* parasitic on the Amaurobiid, *Amaurobius bennetti*, Bl. (=*A. sylvestris*, Em.), and E. Nielsen of *Acrocera globulus*, Panz., on a Lycosid in Denmark ('De Danske Edderkoppers Biologi,' 1928, p. 677). In the first and last of the above observations the larva emerged from the abdomen of the spider to pupate, and the spider died. In the second observation no trace of the spider was found, but the full-grown larva was in the spider's web, so it was presumed that the spider had been killed.

Mr. G. H. Locket recently bred a British Acrocerid, *Oncodes pallipes*, Latr., from the Lycosid *Tarentula barbipes*, Walck. ('Entomologist,' Nov. 1930, p. 241). Prior to this Giard had found a pupa of this fly near the remains of a spider of the genus *Clubiona* (Bull. Soc. Ent. Fr. 1894, cliii.), and Menge bred *either* this species *or* *Henops marginatus*, Meig., from *Clubiona putris*, Koch ('Preussische Spinnen,' p. 37). Locket's spider was a male, and an interesting feature noted by him was that this male constructed a burrow two days before its death, after the manner of the females of this species. He suggests that this is to be explained by the "internal pressure on the body" which in the female "will be produced by the eggs." It seems possible, however, that parasitic castration similar to that found in crabs parasitized by *Sacculina* may be the explanation. Mr. Locket tells me that the male showed no outward differences from a typical male, but this would hardly be expected in spiders if we assume that parasitization took place after the last moult.

In Brazil, near Rio de Janeiro, I found several Phorid flies of a hitherto unknown species, which Dr. Borgmeier is calling *Pericyclocera arachnophila*, living in the burrows of an Aviculariid spider, *Trechona venosa*. The flies, which were too small to attract the spider's attention, were fulfilling the function of housemaids, and breeding in the remains of the spider's meal. In England I have bred *Aphiochæta rata*, Wood, from the remains of a *Theridion ovatum*, Clerck, which presumably had died before the fly laid its eggs. Another fly of the same genus, however, laid its eggs on spiders, *Trochosa terricola*, Thor., paralyzed by the wasp *Psammochares viaticus*, Linn., before they died.

To complete these preliminary notes on the relationship of flies to spiders, I must cite the records known to me of flies actually attacking and eating spiders. Miss E. K. Pearce, in her book on 'Typical Flies,' published by the Cambridge University Press in 1915, says on p. vii.: "certain flies prey on insects and spiders." On being asked for details she informed me that this referred to an observation made by Prof. Theobald on an Asilid, but neither she nor Prof. Theobald could give me the species of fly. D. Melin records *Leptogaster cylindrica*, Deb., preying on "a small spider" (Zool. Bidrag Upsala, 1923, p. 1). Apart from this, there are my own records on an Asilid in Brazil* and an Empid in Ireland. Near Rio de Janeiro I saw two males of the Asilid *Plesiomma fuliginosa*, Wied., seize Epeirid spiders, *Epeira grayi*, Bl., which were sitting in the centre of their webs, and calmly remain seated in the web whilst they devoured the owner. The commotion in one of the webs attracted the attention of the male spider, which came down to see what was happening and then beat a hasty retreat. My other observation was made at Fenit (Co. Kerry) on June 28th, 1929. Spiders were massed on a wall for migration, and an Empid, identified by Mr. J. E. Collin as *Tachydromia pallidiventris*, Mg , was seen eating a female *Erigone dentipalpis*, Wid.

Thus spiders do not have it all their own way.

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* "Notes on the Habits of Insects and Spiders in Brazil," Trans. Ent. Soc., Feb, 1925, p. 483.

# LXV.—Hydroconophora *and* Hydrokerion: *Two new Genera of Cretaceous* Hydractiniidæ. By Prof. J. W. Gregory, LL.D., D.Sc., F.R.S.

[Plates XVIII. & XIX.]

The Hydractiniidæ of Allman * is a group of which but few certain fossil representatives are known, but is of interest—as shown in 1877 by Carter in Ann. & Mag. Nat. Hist. ser. 4, vol. xix. pp. 44–76, pl. viii., in the paper that laid the basis of the geological history of the family—from its possible affinities to the Stromatoporidæ and such genera as *Porosphæra* and *Parkeria*. Mr. G. E. Dibley, F.G.S., of Rochester, has collected from the Kent Chalk some flat cone-bearing fossils which are now in the Hunterian Museum, Glasgow, and in the Rochester Museum. Preliminary examination of these fossils, made at Mr. Dibley's request, showed an apparent combination of the characters of *Hydractinia* and *Porosphæra*. They therefore appeared to support the view of Steinmann and von Zittel as to the near affinity of these genera; for Steinmann † included them both in one family, the Corynidæ, and von Zittel ‡ placed them both in one order, the Tubulariæ, which he did not divide into families. These views are opposed to the conclusion of Delage and Hérouard §, who refer *Hydractinia* and *Porosphæra* to widely separate divisions; for they include *Hydractinia* in a family of the suborder Gymnoblastidæ; they place *Porosphæra* among the Hydrocorallida, but consider that it may be a Foraminifera.

The material sent by Mr. Dibley in connection with the cone-bearing fossils included four series of structures—large thin encrusting sheets with conspicuous cones, fossils composed of a sheet of polygonal plates with a raised aperture at or near the middle of each plate, some molluscs with isolated cones, and three specimens of hemimorphic crystals of calcite. Despite the extreme differences between these four sets of specimens, they have at least one point in common—the development of conical or subconical elevations.

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* J. G. Allman, 'Monograph of the Gymnoblastic or Tubularian Hydroids,' Ray Soc. 1871, p. 342.

† G. Steinmann, "Ueber fossile Hydrozoen, aus dem Familie der Coryniden," Palæontogr. 1878, xxv. p. 105.

‡ von Zittel, 'Handbuch der Palæontologie,' vol. i. pt. 1, 1876, p. 282; and 'Grundzuge der Palæontologie,' 1895, pp. 101–2; Textbook of Pal. vol. i. 1900, pp. 110–11.

§ 'Traité de Zoologie Concrète,' vol. ii. pt. 2, 1901; 'Les Cœlentérés,' pp. 71–74, 113.

These fossils present the usual difficulties with this group of Hydrozoa owing to their indefinite characters and extreme variability. The possibility had to be considered of their all being varieties of one species, for part of the type-specimen of *H. dibleyi* shows a faint development of polygonal lines on the hydrosoma; nevertheless, this appearance does not break the distinction between the even surface of that species and the polygonal plates separated by furrows in *Hydrokerion*. The generic distinctness of the two series of fossils seems established by the occurrence of the *Hydrokerion* type in at least three marked species on different horizons—Chalk, Eocene, and Pliocene. The point on which I am most doubtful is whether the type-specimen of *H. dibleyi* should not be separated specifically from those growing superposed on shells, as shown in Pl. XVIII. fig. 4, Pl. XIX. fig. 5; but consideration of the whole range of these specimens suggests that they all belong to one species.

I am much indebted to Mr. Dibley for information regarding the horizon of the fossils and for the loan of material for aid in comparison of the microscopic structure with that of some other Chalk fossils. As the cone-bearing and polygonal fossils are conspicuous and apparently not especially rare in the Chalk, it appeared most probable that they had been collected and studied previously. I accordingly enquired in London what had happened to such material. Dr. Kitchen kindly informed me of a specimen in the Geological Survey Museum from the collection of E. Charlesworth that had been studied by G. J. Hinde, and secured me its loan. Dr. C. D. Sherborn, who has long been interested in these structures, called my attention to one encrusting an Ammonite in the British Museum Collection, and referred me to Dr. Spencer, who had studied the crystal groups, and who kindly lent me a specimen collected near Winchester by Dr. Bather forty years ago. Prof. W. T. Gordon kindly examined one of the specimens, and made from it two carefully prepared thin sections. I am also indebted to Mr. F. Filshill, of the University of Glasgow, for the trouble devoted to photographs of these fossils and sections, and to Mr. Arthur Curlett, of the Geological Department of the same University, for the care taken in cutting slides of this troublesome material. I am also grateful to Dr. Ethel Currie for help in dealing with this material, and to Dr. Weir and Mr. Cox for aid in regard to the associated molluscs.

I. The calcite crystals may have no direct connection with the fossils. They are pyramidal and hemimorphic, and are found in the Chalk on large decomposed shells, especially Ammonites. I have seen similar calcites from other formations associated with the aptychi of Ammonites. They have been referred to (from their shape) as "Chinaman's hats." Thin sections were cut from one of Mr. Dibley's specimens on the chance of tracing the source of the material, as they seemed obviously due to the solution and redeposition of some organic carbonate of lime. One of the sections includes a fragment of a fibrous shell, which is doubtless lamellibranch and probably an Inoceramoid. This crystal was therefore due to the alteration of a lamellibranch, not, as I had expected, of an Ammonite. These crystals may derive their material from various calcareous organisms. Their pyramidal habit is probably due to slow formation on the floor of the sea at a moderate depth. Dr. L. J Spencer, F.R.S., has carefully studied the crystallographic features of these crystals, and he has given me several references to literature upon them, dating back to Wm. Dunker, 'Norddeutschen Wealdenbildung,' 1846, pp. xi–xii, pl. xiii. fig. 23, who described them aptly as "patellenähnlichen Formen."

II. *The Hydrozoa.*—The three other groups of material, after repeated re-examination and reconsideration of the evidence, are referred to two new genera of Hydractiniidæ.

## I. HYDROCONOPHORA, gen. nov.

*Diagnosis.*—Hydractiniidæ in which the hydrosoma is a thin calcareous sheet bearing a series of irregularly distributed massive cones. The cones may grow independently on shells or other bodies. The interstitial chambers are connected with circular or subcircular apertures which may be numerous, sparse, or absent. Surface of the hydrosoma even, but ornamented by small granules. No polygonal grooves or astrorhizæ.

The upper layer is compact, with very minute pores.

The main part of the hydrosoma consists of irregular reticulate spaces and canals between the skeletal tubes and rods.

Type-species: *H. dibleyi*, sp. n., Middle Chalk, Cuxton, near Rochester, and Halling, Kent.

*Affinities.*—*Hydroconophora* differs from the typical species of *Hydractinia*, Beneden (*Hydractinie*, van Beneden, 1841, Bull. Ac. R. Brux. vol. viii. p. 89; vol. xviii. p. 104, pl. ix.; *Hydractinia*, Nouv. Mém. *ibid.* vol. xvii. 1844, p. 62, pl. vi. figs. 1–14), by having a calcareous instead of chitinous skeleton and larger cones, which are thick and massive representatives of the larger spines of *Hydractinia.*

The general structure of the hydrosoma as seen in worn parts, when the upper layer has been removed, agrees with that of *Porosphæra* ; but the form of the hydrosoma is quite distinct, and there are no astrorhizæ.

The microscopic structure is distinctively hydrozoan and similar to that of *Porosphæra.* The thin compact surface-layer is like that lining the concave side of *Porosphæra urceolata.* There are no radial pillars as in that species, but the general texture and the grouping of small interstitial spaces in a circle around a slightly larger space (as seen in Pl. XVIII. fig. 3) agree with the structure of *Porosphæra globularis.* In places in a section cut from a specimen from the Blue Bell Pit eight of the spaces occur around the central space.

The resemblance in essential structure to *Porosphæra* supports the view of von Zittel of the affinity of *Porosphæra* and *Hydractinia.*

Several of the specimens bear circular osculiform apertures about 1 mm. in diameter; their crenate edge gives them a resemblance to the larger apertures and pseudosepta of the Helioporids. The notches are, however, only analogous to the grooves between pseudosepta, as they are due to interstitial canals and not to small zooids. They are therefore less regular in number and size than the notches between the pseudosepta of the Helioporids. The apertures lead to the interstitial chambers which have been figured by Carter in the living *H. calcarea.* Carter called them pits, fossæ, and circular areas (Carter, Ann. & Mag. Nat. Hist. ser. 4, xix. 1877, pp. 50–74, pl. viii. fig. 5 ; also in figs. 8 & 11 for *H. pliocena* (Allm.) and *H. vicaryi*, Carter) ; but as they are chambers rather than moats or trenches, the term fossa appears inappropriate. Their development is irregular, for there seems no necessity for the direct opening of the interstitial chambers to the surface. Those chambers which have this connection may have contained gonozooids, and the number of the apertures vary seasonally. They are well developed in a specimen from Cuxton and are sparse on the large slab from Halling.

### *Hydroconophora dibleyi*, sp. n. (Pl. XVIII. ; Pl. XIX. figs. 1 & 5.)

Hydrosoma a broad thin reptant sheet bearing numerous cones, which may also grow as isolated cones attached to shells. Surface of the sheet minutely granulate. Upper layer continuous and composed of a thin crust with numerous minute pores.

The pores are irregularly arranged. Internal chambers numerous, but with few osculiform apertures on the upper surface.

*Dimensions.*—

| | | Type-specimen. | H.M. fig. 4. |
|---|---|---|---|
| Hydrosoma: | Length ....... | 12 inches. | 58 mm. |
| | Width ........ | 7 " | 35 " |
| | Cone, diameter.. | 8–9 mm. | 9 " |
| | Cone, height.... | 8 " | 5 " |

*Distribution.*—Lower Senonian–Turonian: *Rhynchonella cuvieri* to *Micraster cortestudinarium* zones, Halling, near Rochester, and Trechmann's Pit, Cuxton, near Rochester.

Turonian: *Terebratulina gracilis* zone, Cuxton. Attached to an *Ostrea* and also to a *Pecten orbicularis*, Cuxton.

*Affinities.*—Among previously described Hydractiniidæ the species which is nearest in features is the *Hydractinia cretacea*, Fischer, from the Cenomanian of Le Mans (Bull. Soc. Géol. Fr. (2) xxiv. pp. 689–690). It is attached to gastropod shells in apparently multilamellar laminæ; the surface is uniformly granular and has some small tubercules, and not the massive cones of *Hydroconophora.*

This fossil reminded me of the figure by Allman (Ray Soc. Mon. 1871, pl. xv. fig. 1) of a female colony of *Hydractinia echinata*, which consists of a smooth sheet bearing cones varying from a height of about a third of the width to six times the width. The colony is covered by pores which occupy the centres of polygonal areas, which are about equal to from a half to a third of the diameter of the base of the zooids. The spines are chitinous and composed of thin laminæ with a cavernous axial space. Allman's figure (*ibid.* pl. xvi. fig. 10) of a vertical section through the basal expansion of the colony shows a thin superficial layer with minute pores, as in the new species.

The vertical structure of the hydrosoma of *H. dibleyi*, as shown in Pl. XVIII. fig. 5, consists of a thin compact layer, about 2 mm. in thickness, composed of very minute crowded cells; below is a layer traversed by irregularly branching canals, with interstitial chambers which are ovoid in section and about ½ mm. in width. The structure agrees in general, though without the regular vertical pillars, with the vertical sections of *Hydractinia echinata* by Carter *.

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* Ann. & Mag. Nat. Hist. ser. 4, vol. xi. p. 15, pl. i. figs. 8 & 9.

A section cut through the specimen (Pl. XVIII. fig. 4) shows the superposition of the cone on the shell to which it is attached.

The type-specimen in the Rochester Museum has about 150 cones and well-marked apertures to the interstitial chambers; on part of the surface are faint angular sutures, which may be an incipient development of the furrows conspicuous in *Hydrokerion*.

### II. HYDROKERION, gen. nov.

(*Kerion*, honeycomb, from the form of the constituent units in the hydrosoma.)

*Diagnosis.*—Hydractiniidæ with the hydrosoma composed of a mosaic of polygonal plates; most of the plates are raised in the middle into blunt cones or hummocks, each of which has a large aperture. Astrorhizal grooves thin and irregular and radiating from the aperture. Osculiform apertures absent or scarce.

Type-species: *H. sherborni*, sp. n.

*Distribution.*—Middle Chalk: Kent and Hampshire.

Eocene: Kressenberg, Bavaria.

Pliocene: Asti, N. Italy.

*Affinities.*—This genus differs from *Hydroconophora* by the division of the hydrosoma into polygonal plates by a network of grooves. The cones are reduced to low blunt elevations. A vertical section of *Hydrokerion* shows that it consists of reticular tissue traversed by compact laminæ, which represent the surface at successive stages of growth.

The fossils on which this genus is based appeared at first sight echinodermal, as if they might be some thick-plated form of free-swimming crinoid; but the microstructure is not echinodermal, and the faint astrorhizal grooves also indicate its hydrozoan nature.

#### 1. *Hydrokerion sherborni*, sp. n. (Pl. XIX. figs. 2–4.)

*Diagnosis.*—*Hydrokerion* with the hydrosoma composed of moderately thick plates, about 10–15 mm. in width, varying from irregularly quadrangular to hexagonal.

Aperture raised on a low central elevation.

Surface smooth except where furrowed by faint astrorhizæ.

*Dimensions.*—

| | Type. | Geol. Surv. Spec.<br>XIV. $\frac{1}{4E}$ 1508. |
|---|---|---|
| Hydrosoma ........ | 40×60 mm. | 9×4½ in. |
| Plates: diameter.... | 8–10 mm. | 10–15 mm. |

*Distribution.*—Lower Senonian: base of *Actinocamax quadratus* zone, Rottingdean, Sussex.

Turonian: *Rhynchonella cuvieri* zone, Peter's Pit, Wouldham, near Rochester; *R. cuvieri–Holaster planus* zones: Blue Bell Hill and Cuxton, near Rochester; south-east of England (Geol. Surv. Coll.).

*Affinities.*—A specimen in the Museum of the Geological Survey is 9 in. by 4½ in. in width, and consists of a group of quadrangular and hexagonal plates; their average diameter is 10–15 mm.; one quadrangular plate is 12 mm. wide by 23 mm. long. Each plate bears a low cone from 5–7 mm. high; the cones are mostly single, but one consists of three blunt hummocks. There are no osculiform apertures. This specimen shows that the flat and conical plates belong to the same organism.

The specimen was from the collection of E. Charlesworth. It was carefully examined by G. J. Hinde, and a remark in his handwriting says: "Does not seem to be a sponge.—G. J. H." It is labelled "Lower Chalk [Hydrozoon] *Spongia*?."

A worn encrustation on a large Ammonite, *Parapachydiscus leptophyllus* (Sharpe) from the base of the *quadratus* zone, Rottingdean, in the British Museum (Nat. Hist.) C 5940, represents this species at a slightly higher horizon. The encrustation is 90 mm. by 45 mm.; the plates are about 9 to 12 mm. in diameter; the pentagons are very irregular in shape. Though the surface is much worn, some of the plates show the aperture and astrorhizæ. My attention to this specimen was kindly called by Dr. Sherborn.

### 2. *Hydrokerion zitteli*, sp. n.

The fossils to which this species is most akin have been hitherto included in *Hydractinia*. Thus the specimen figured by von Zittel as *Hydractinia pliocena* from the Pliocene of Asti, Italy, has the surface divided by sections into polygonal areas, which rise in the centre to a tubercle around a central aperture (Handb. Pal. vol. i. 1876, p. 282, f. 192, *c*, *d*). These features are not seen in the true *H. pliocena** of Allman, which has been carefully examined and figured by Carter. Von Zittel's figures are characteristic of *Hydrokerion*, and his specimen may be regarded as a distinct species, and for convenience of reference may be called *Hydrokerion zitteli*, sp. n.

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* Geol. Mag. 1872, pp. 337–8; Carter, Ann. & Mag. Nat. Hist. (4) vol. xix. 1877, p. 52, pl. viii. figs. 7–10.

*Hydractinia pliocena*, Allman, was founded on a fossil from the Coralline Crag of Orford and Gedgrave in Suffolk; the type is in the British Museum. Allman based the distinction from *H. echinata* and *H. cretacea* only on that of age. Precise knowledge of *H. pliocena* dates from the description by Carter. It is a normal calcareous species of *Hydractinia*, and has no cones.

*Hydractinia vicaryi*, Carter[*], from the Upper Greensand of Haldon Hill, Steinmann regarded as also a *Hydractinia*; it has no cones.

### 3. *Hydrokerion gregaria* (Schafh.).

A third species is the *Spongilla gregaria*, Schafh.[†], from the Eocene of Emmanuel, Bavaria. Schafhaütl's figures are by themselves indeterminable: he included the fossil among the sponges, but said that on first impression it resembled the Bryozoa and he compared it with them. His figures show that the fossil consists of polygonal plates from 2–5 mm. wide (Schafhäutl gives as measurements 2–3½ mm. wide). It is said to be not rare. Steinmann[‡] has redescribed and figured the species as *Hydractinia gregaria* (Schafh.). He included it among the species with a chitinous crust, but that composition seems improbable. His enlarged figure shows that the hydrosoma consists of polygonal plates, each perforated by a raised central aperture and with structures that resemble Hydrozoan canals and astrorhiza.

So far as can be judged from the figures Steinmann's view that it is allied to the Hydractiniids seems correct; and if so, the known features are those of *Hydrokerion*.

*Possible Algal Affinity.*—The sections of *Hydrokerion* with their densely packed close cells, in layers separated by compact thin laminæ, present a resemblance to some calcareous algæ such as *Solenopora garwoodi*, Hinde[§], of the Carboniferous Limestone of Ravenstonedale, and *Archæolithothamnium provinciale*, Pfender[||], of the Cretaceous of Provence. The structure of *Hydroconophora*, moreover, with its canals is reminiscent of *Micheldeania* and of the *Solenopora condensata*, Merian[¶], of the Swiss Sequanian.

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[*] *H. vicaryi*, Carter, 1877, pp. 53–4, pl. viii. fig. 11.

[†] K. E. Schafhaütl, 'Sud-Bayerns Lethæa Geognostica,' 1863, pp. 30–1, pl. iii. figs. 8 *a–c*.

[‡] Steinmann, 1878, *op. cit.* p. 109, pl. xii. fig. 3.

[§] Hinde, Geol. Mag. 1913, p. 289, pl. x.

[||] Jul. Pfender, "Mélobesiées Calc. Crét. Basse-Provence," Mém. Soc. géol. Fr. n. s. vol. iii. fasc. 2, Mém. 6, 1926, pl. xx. fig. 4.

[¶] *Cf.* E. Peterhans, "Algues Solenoporacées Malm Jura balois et sol," Abh. Schweiz. Pal. Ges. vol. xlix. 1930, pl. vii. figs. 1 & 3.

The algal resemblance is most marked for the thin compact layer on the surface of *Hydroconophora*. I accordingly submitted a specimen and slide to Prof. W. T. Gordon, who kindly prepared two excellent sections and lent me some slides of Carboniferous algæ for comparison. Prof. Gordon reported that the specimen submitted to him in his opinion was not algal. That conclusion is supported by the distribution and structure. The organism must have lived on the floor of the Chalk sea, which would have been too deep for the growth of encrusting calcareous algæ. The arrangement of the cells is, moreover, different, as there is a tendency in all the specimens for some of the cells to form a circular series around a central and often slightly larger cell.

The cells are, moreover, except for the upper layer of *Hydroconophora*, larger in diameter than those of the algæ. Thus in *Solenopora condensata*, Mer.*, the diameter of the cellules is 25–60 μ and in *Solenopora helvetica* †, Peterhans, the mean diameter is 30–45 μ, and in *Pseudochætetes champagnensis* ‡, Peterhans, also from the Swiss Jurassic, the mean diameter is 30–45 μ, and the extreme range is stated by Peterhans to be from 25–50 μ. In these new fossils the cellules are much larger.

The algal affinity may be suggested by some resemblance of the circular apertures of the interstitial chambers to the circular pits, which sometime have a crenate edge, in some fossil algæ, such as *Chorellopsis* § ; but the pits in it are much larger, being up to half an inch in diameter.

The evidence is against the algal nature of these fossils.

## EXPLANATION OF THE PLATES.

### Plate XVIII.

*Fig.* 1. *Hydroconophora dibleyi*, gen. et sp. n., about ½ nat. size. Middle Chalk: Cuxton, Kent. Rochester Museum.

*Fig.* 2. *Hydroconophora dibleyi*, nat. size. Middle Chalk: Cuxton, Kent. Hunterian Museum.

*Fig.* 3. *Hydroconophora dibleyi*. Part of the weathered surface of another specimen on the same slab of Chalk. × 8 diam.

*Fig.* 4. *Hydroconophora dibleyi*. Four isolated cones on an *Ostrea*; nat. size. Chalk: Cuxton. Hunterian Museum.

*Fig.* 5. *Hydroconophora dibleyi*. Part of a vertical section from a fragment from the same slab of Chalk as figs. 2 & 3.

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* Peterhans, Abh. Schweiz. Pal. Ges. vol. xlix. 1930, p. 7.

† *Ibid.* p. 4, pl. vi. figs. 1, 2.

‡ *Ibid.* p. 9, pl. iv. fig. 2.

§ *Cf.* W. H. Bradley, "Algæ of Green R. Formation," U.S. G. S. Prof. Pap. 154 G, 1929, pl. 38, fig. A, & pl. 37, fig. B.

### PLATE XIX.

*Fig.* 1. *Hydroconophora dibleyi*, gen. et sp. n. Part of the worn surface of a third specimen on the same slab of Chalk as Pl. XVIII. figs. 2 & 3, showing the interstitial canals and chambers; the rims of two overlapping layers are seen to the left. × 8 diam.

*Fig.* 2. *Hydrokerion sherborni*, gen. et sp. n., nat. size. Middle Chalk: *Rhynchonella cuvieri* zone, Peter's Pit, Wouldham, near Rochester. Hunterian Museum.

*Fig.* 3. *Hydrokerion sherborni*, ⅓ nat. size. Middle Chalk: Cuxton. Hunterian Museum.

*Fig.* 4. Part of specimen of same species in the Charlesworth Coll., Geol. Surv. Museum.

*Fig.* 5. *Hydroconophora dibleyi*. Two of the cones on specimen, Pl. XVIII. fig. 4. × 5 diam.

## LXVI.—*On London Clay Crabs of the Family* Raninidæ.

By MARTIN F. GLAESSNER and THOMAS H. WITHERS.

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[Plates XX. & XXI.]

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### INTRODUCTION.

Mr. A. G. Davis recently collected in the London Clay of Tolworth, Surrey, a number of specimens of a Raninid crab. It was associated with *Hoploparia* sp., *Xanthopsis* sp., and *Mithracia libinioides*, Bell. Before this crab could be specifically determined it became necessary not only to examine the types of "*Palæocorystes*" *glabra*, H. Woodward, and "*Raninellopsis*" *gottschei*, J. Böhm, but to make a comparison with other Tertiary Raninid crabs referred to different genera. This paper is the outcome of this comparison, which shows that the new specimens must be referred to the German species "*Raninellopsis*" *gottschei*, J. Böhm, rather than to "*Palæocorystes*" *glabra* from the Hampshire basin. The generic characters of these and other Tertiary Raninid crabs are discussed. The new specimens of "*Raninellopsis*" *gottschei* are much more complete than the type and practically all the known fossil forms of this group, so that from them it is possible to base a reconstruction.

"*Palæocorystes*" *glabra* occurs in the sandy beds of the London Clay of Portsmouth, and is associated with *Linuparus* *eocenicus*, Woods, *Litoricola glabra*, H. Woodward, *L. dentata*, H. Woodward, *Rhachiosoma bispinosa*, H. Woodward, and *R. echinata*, H. Woodward. None of these species occur in the London Basin, although *Linuparus* is there represented by *L. scyllariformis* (Bell) from Chalk Farm, Highgate, Sheppey, and Herne Bay. *Litoricola* aff. *glabra*, H. Woodward, has been found recently by Mr. E. M. Venables in the London Clay of Bognor, Sussex.

"*Raninellopsis*" *gottschei* occurs at Hemmoor, near Cuxhaven, with *Squilla wetherelli*, H. Woodward, *Linuparus scyllariformis* (Bell), *Hoploparia belli*, M'Coy, *Dromilites bucklandi*, M.-Edw., *Xanthopsis leachi*, Desm., *Xanthilites bowerbanki*, Bell, and *Goniochela angulata*, Bell, and all these species occur in the London Clay of the London Basin. So far *Mithracia libinioides* has not been found at Hemmoor, although it occurs with "*R.*" *gottschei* at Tolworth, Surrey.

## DESCRIPTIONS.

*Læviranina glabra* (H. Woodward). (Pl. XXI. figs. 2–4.)

1871. *Palæocorystes glabra*, H. Woodward, Quart. Journ. Geol. Soc. London, xxvii. p. 90, pl. iv. figs. 1 *a. b.*

1923. *Palæocorystes glaber*, H. Woodw.; Van Straelen, Bull. Acad. Belg. Cl. Sci. p. 120.

1929. *Raninellopsis? glabra*, H. Woodw.; Glaessner, Fossilium Catalogus, xli. p. 370.

*Diagnosis.*—Carapace with the antero-lateral spine wide and strong. Surface ornamented with fine granulations in the form of forwardly directed spines, which become more pronounced as granules on the anterior part. Cardiac furrows clearly marked.

*Distribution.*—Ypresian, Lower Eocene, London Clay: Portsmouth.

*Holotype.*—A cephalothorax in the Geol. Surv. Museum (ex Caleb Evans and Geol. Soc. Colls.). Two further examples of the cephalothorax are in the Sedgwick Museum, Cambridge (Meyer Coll.).

*Description.*—Cephalothorax about one-and-a-half times as long as wide, broadly and bluntly angular transversely, and slightly convex longitudinally. Rostrum and most of the orbital border broken off; extra-orbital tooth produced into a short spine, nearly directed forwards. Fronto-orbital margin about two-thirds the greatest width of the carapace. Antero-lateral margin ending with a spine; the base only is preserved, and this is very wide and strong. Lateral spine much stronger than the extra-orbital spine, and situated nearer to the orbital spine than to the widest part of the carapace. Behind the lateral spine the edge is granulated, and from this granulated edge extends a double row of close granules forming a ridge. A postfrontal ridge extends between the lateral teeth. Carapace ornamented with fine pits, somtimes rounded but often longitudinal, becoming more numerous anteriorly ; where well preserved there are extremely fine granulations in the form of forwardly directed spines, which become more pronounced as granules on the anterior part of the carapace. Cardiac furrows clearly marked on the outer surface of the shell.

### *Læviranina gottschei* (J. Böhm).
### (Pl. XX. figs. 1–4 ; Pl. XXI. fig. 1 ; text-fig.)

1906. *Ranina* sp., C. Gagel, Jahrb. preuss. geol. LdAnst. (1905) xxvi. Hft. ii. p. 260.

1918. *Raninoides gottschei* (n. n.), J. Böhm, Z. deuts. geol. Ges. Berlin, lxx. Monatsb. p. 35.

1922. *Raninellopsis gottschei* (n. n.), J. Böhm, Samml. geol. Rchsmus. Leiden, N.F., i. Abt. 2, Hft. iv. p. 527.

1923. *Ranina gottschei* (n. n.), C. Gagel, Jahrb. preuss. geol. LdAnst. xliii. p. 184.

1925. *Ranina gottschei* (n. n.), K. Gripp, 17 Niedersächs. geol. Ver. p. 129.

1927. *Raninellopsis gottschei*, J. Böhm, Jahrb. preuss. geol. LdAnst. xlviii. p. 563, figs. 1, 2.

*Diagnosis.*—Carapace with the antero-lateral spine narrow and short. Surface almost smooth, with close-set granulations in the region of the postfrontal ridge and fronto-orbital parts. Cardiac furrows not present on the outer surface.

*Distribution.*—Ypresian, Lower Eocene, Cement Works near Hemmoor, near Cuxhaven. Sandy top beds of London Clay (=5th division of Wrigley *), on the surface of a Septarian nodule: Tolworth Brick Co.'s pit, in Red Lion Lane, Tolworth, near Surbiton, Surrey †.

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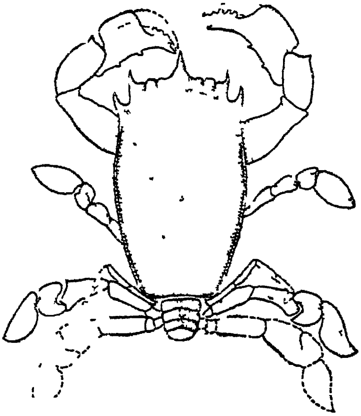
* Wrigley, A., 1924, "Faunal Divisions of the London Clay," Proc. Geol. Assoc. London, xxxv. pp. 245–259 (see pp. 152 and 249 for account of section).

† Since this paper was written, a specimen agreeing in all respects with the type and other specimens has been found among the undetermined material in the British Museum (no. 59117). It is a cast of the cephalothorax showing well the sternum and the pterygostomian regions. Of further interest is the fact that it comes from the London Clay of Highgate Archway, London, for the beds there are, according to Wrigley, of exactly the same age as the beds at Tolworth, Surrey.

*Holotype.*—A cephalothorax from Hemmoor (Pl. XXI. fig. 1), in the Prussian Geological Survey, Berlin.

Six other specimens, from Tolworth, Surrey, are in the Geological Department of the British Museum (In. 27875–In. 27880), and these were collected by Mr. A. G. Davis.

*Description.*—Cephalothorax about one-and-a-half times as long as wide, moderately convex transversely, with an obscure median fold, and slightly convex longitudinally. Rostrum triangular, with a slight median furrow; orbital margin almost straight; extra orbital tooth produced into a short spine, nearly directed forwards; inner fissure the same distance from the median line as from the extra-orbital spine; outer fissure the same distance from the extra-orbital spine as from the inner fissure; base of extra-orbital spine not in line with the base of the rostrum, but a little posteriorly. Fronto-orbital margin about three-fourths of the greatest width of the carapace. Antero-lateral margin directed backwards and slightly inwards and ending with the lateral spine; lateral spine about the same size as the extra-orbital spine, and situated about the same distance from the extra-orbital spine as from the widest part of the carapace. Behind the lateral spine the edge is granulated, and from this granulated edge extends a single row of granules forming



*Læviranina gottschei* (J. Bohm).

Reconstruction. Anterior part of carapace based on specimen In. 27877; posterior part of carapace, abdomen, and legs on In. 27875; chela based on In. 27876. Missing parts indicated by dotted lines. $1\frac{3}{4}$ nat. size.

a ridge round the postero-lateral and posterior margins. Posterior margin less than two-thirds the width of the carapace. A postfrontal ridge extends immediately in front of the lateral teeth. Carapace ornamented with extremely fine, rounded, unequal-sized pits, becoming more numerous anteriorly, and with close-set granulations in the region of the postfrontal ridge and of the fronto-orbital parts. No furrows are present on the outer surface of the shell.

Abdomen of the male more than one-fourth the width of the carapace.

Chela and pereiopods as in the recent species of the genus *Raninoides*.

### *Comparison with other Species.*

*Læviranina glabra* (H. Woodward, 1871), from the Lower Eocene of Portsmouth, differs from *L. gottschei*, from the Lower Eocene of Hemmoor, in the presence of distinct cardiac furrows, a stronger lateral spine, and the type of ornamentation. The four American Eocene species of *Raninoides* (*R. dickersoni*, *R. lewisanus*, *R. vaderenis*, and *R. washburnei* of Rathbun, 1926) apparently differ from the former in the details of the front and ornamentation; no indication is shown of a postfrontal ridge. The two latter species have definite cardiac furrows. The American Oligocene species of *Raninoides* (*R. asper*, *R. eugenensis*, and *R. fulgidus* of Rathbun, 1926) have a more slender carapace, with the lateral spine directed outwards.

Of the other European Eocene Raninids belonging to the same group *Læviranina budapestinensis*, Lörenthey (1898, p. 23, pl. i. fig. 2; 1929, p. 107, pl. iv. fig. 12), is distinguished by the stronger postfrontal ridge which is situated behind the lateral spines. *L. fabianii*, Lörenthey (1929), differs from *L. gottschei* in having cardiac furrows and a granular surface. It may be that *L. fabianii* is conspecific with *L. glabra*, for no differences are apparent in the figure and description; the figure does not show the lateral spines mentioned in the description, and without a comparison of the types their identity cannot be proved. *L. notopoides* (*Ranina notopoides*, Bittner, 1883, p. 304, pl. i. fig. 3) differs in having a granulated carapace with nearly smooth fronto-orbital parts, the absence of a postfrontal ridge, and in the position of the lateral teeth. Bittner's figure shows a reconstruction of the front (evidently based, without justification, on *Lophoranina*) and an enlarged drawing of the fronto-orbital region of this wrong reconstruction has been figured by Beurlen in Lörenthey (1929, p. 292, fig. 11 *d*). *L. ombonii* (Fabiani, 1910, p. 2, pl. ii. fig. 1) and *L. simplicissima* (Bittner, 1883, p. 305, pl. i. fig. 4) appear to have no lateral teeth. *Notosceles bournei*, Rathbun, 1928, p. 1, pl. i. figs. 1–4, from the Lowest Eocene (Midway Group) of Texas, differs markedly from *L. gottschei* in the shape of the rostrum and from *L. glabra* in the absence of granulation on the median and posterior parts and the shape of the lateral spines.

## *Systematic Position.*

There is some difficulty in placing these forms in their proper systematic position, since several genera have been described without adequate comparison with each other. It is apparent that they show similar relation to species described under the genera *Raninellopsis*, *Raninoides*, *Lævi-ranina*, and *Notosceles*. They must belong to one of these genera, but before this can be settled the limits of the genera must be defined.

J. Böhm (1922, p. 526, pl. 63. fig. 12) described a new species of a Raninid from the Miocene of Java as *Raninellopsis javana*. It was compared with *Raninellopsis gottschei*, but this latter species was not described until his paper of 1927, in which the generic characters were for the first time given. *Raninellopsis* being monotypic from 1922, *R. javana* must be considered as the genotype.

*R. javana* is known only by the middle and posterior parts of the carapace and the sternum, and it is not possible to discern any difference in these parts from the Recent *Raninoides*. Böhm (1927, p. 566) distinguishes *Raninellopsis* from *Raninoides* in the following characters:—"The cephalothorax of the slender genus *Raninoides*, H. Milne-Edwards, has its greatest width in the posterior third, the narrow frontal margin ending on both sides with a long spine. Further, the sternum is again broadened not only between the second but between the third pair of legs, so that these are far from the median line, and the sternum becomes narrower only in the region of the fourth pair of legs." Böhm quotes this last sentence from Bittner (1875, p. 73), but some mistakes have been made in this quotation, and the diagnosis is open to misinterpretation. It is therefore preferable to take that of Alcock (1896, p. 292), namely:— "Carapace remarkably elongate-obovate, strongly convex from side to side, about twice as long as broad, its surface for the most part smooth, the regions undefined. Fronto-orbital border slightly less than the greatest width of the carapace. . . . .

"Merus of the external maxillipedes shorter than the ischium ; its edges slightly thickened and raised.

"Sternum broad between the chelipeds and as far as the bases of the second pair of true legs, then becoming extremely narrow.

"Last pair of legs abnormally short and slender, arising much in advance of the penultimate pair."

The characters of *Raninellopsis javana*, so far as they are shown in the specimens, when compared with the latter diagnosis leave no option at present but to regard *Raninellopsis* as a synonym of *Raninoides*. It has to be borne in mind, however, that more complete specimens of *R. javana* might show that there are generic differences, in which case *Raninellopsis* would become valid.

Of *Læviranina*, Lörenthey, 1929, p. 105 (see also Beurlen, 1930, p. 376), the genotype, *L. budapestinensis*, was fixed by Glaessner (1929, p. 364). The characters of this genus can be defined as follows :—Carapace about one-and-a-half times as long as wide, strongly convex from side to side, its surface with fine pits and often with small granules, cardiac grooves sometimes present. Fronto-orbital border about two-thirds the width of the carapace ; it is wider compared with the length than in *Raninoides*. Distance between extra-orbital and lateral spines short. Postfrontal ridge often present.

It would seem that the most important differences lie in the proportions of the carapace.

*Raninellopsis gottschei*, J. Böhm, and *Palæocorystes glabra*, H. Woodward, evidently have the characters cited for *Læviranina*.

Of the *Læviranina* species *L. fabianii* and *L. notopoides* resemble the type so much that they must be included in the genus*.

There seems to be no generic difference between the European species of *Læviranina*, s. str., and the four American Eocene species described as *Raninoides* by Rathbun, 1926 (*R. dickersoni*, *R. vaderensis*, *R. lewisanus*, and *R. washburnei*). On the other hand, the Oligocene species *Raninoides eugenensis*, *R. fulgidus*, and *R. asper* agree in the proportions of the carapace with the recent genus. The Eocene *Notosceles bournei*, Rathbun (1928, p. 1), has the proportions of the Recent *Notosceles*, but the sternum is much more like that of *Raninoides*.

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* *L. ombonii* (Fabiani, 1910, p. 2, pl. ii. fig. 1) and *L. simplicissima* (Bittner, 1883, p. 305, pl. i. fig. 4), apparently having no lateral spine, belong to some other group.

The species here mentioned can be grouped as follows :—

### Family **Raninidæ** *, Dana.

LÆVIRANINA, Lörenthey, 1929.

*L. budapestinensis*, Lörenthey, genotype. Upper Eocene.
*L. fabianii*, Lörenthey. Middle Eocene.
*L. notopoides* (Bittner). Middle Eocene.
*L. glabra* (H. Woodward). Lower Eocene.
*L. gottschei* (J. Böhm). Lower Eocene.
*L. vaderensis* (Rathbun). Eocene.
*L. lewisana* (Rathbun). Eocene.
*L. washburnei* (Rathbun). Eocene.
*L. dickersoni* (Rathbun). Middle Eocene.

RANINOIDES, H. Milne-Edwards, 1837.

*R. lævis* (Latreille), genotype. Recent.
*R. asper*, Rathbun. Oligocene.
*R. eugenensis*, Rathbun. Oligocene.
*R. fulgidus*, Rathbun. Oligocene.
*R. javanus* (J. Böhm). Miocene.
*R.*? *araucana* (Philippi) †. Oligocene or Lower Miocene.

NOTOSCELES, Bourne, 1922.

*N. chimmonis*, Bourne, genotype. Recent.
*N.* (?) *bournei*, Rathbun. Lowest Eocene.

There is no clearly marked division between the forms included in *Læviranina* and *Raninoides*, but the Eocene forms have a common character, namely, the greater comparative width of the carapace. This feature indicates only the more primitive stage of evolution, which, apparently, leads from the Cretaceous Raninids (Beurlen, 1929, 1930) to the more highly specialized Recent *Raninoides* (see Bourne, 1922, p. 68).

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* Beurlen (1930, p. 363) has proposed to split up the family Raninidæ into two families, Raninidæ (s. str.) and Raninellidæ. There is no marked difference between these families, except that in Raninidæ (s. str.) the third sternal segment is constricted laterally; but this difference is a gradual one, and merely expresses the stage of evolution. However, it seems highly probable that several families may later have to be established in the Gymnopleura, but this is not possible now, and apparently not in the way proposed by Beurlen.

† This Raninid, described by Philippi (1887, p. 222, pl. L, fig. 6) as *Symnista araucana*, gen. et sp. n., apparently falls into *Raninoides*.

The few Recent species of *Raninoides* are merely relics of a more widely dispersed group which flourished in the Eocene seas of N. and Mediterranean Europe and of N. America.

It is probable that a similar line of evolution is indicated by the N. American Eocene *Notosceles? bournei*, Rathbun, which appears to differ from the Recent species of the genus chiefly in the more primitive sternum.

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## EXPLANATION OF THE PLATES.

### PLATE XX.

*Læviranina gottschei* (J. Böhm).

Ypresian, Lower Eocene, near top of London Clay:
Tolworth, Surrey.

*Fig.* 1. Cephalothorax, showing details of front (rostrum broken off). In. 27877.

*Fig.* 2. Cephalothorax (a little distorted), showing details of front, including rostrum. In. 27878.

*Fig.* 3. Cephalothorax (front broken), with the cheliped on the left side, followed by three of the walking-legs (only the meropodite preserved). In. 27876.

*Fig.* 4. Nearly complete example, showing cephalothorax (crushed longitudinally) with the front missing, the first abdominal segments, and the four hinder pairs of legs (two complete). In. 27875.

(All figs. × 3 diam.)

(All the specimens are in the Geological Department of the British Museum.)

### PLATE XXI.

*Læviranina gottschei* (J. Böhm).

Ypresian, Lower Eocene: Hemmoor, near Cuxhaven.

*Fig.* 1. *a*, cephalothorax; *b*, underside of same, showing sternum. Holotype, Prussian Geol. Surv., Berlin *.

*Læviranina glabra* (H. Woodward).

Ypresian, Lower Eocene, London Clay: Portsmouth.

*Fig.* 2. *a*, cephalothorax; *b*, side view of same, showing exuviation (referred to, M. Glaessner, 1929, 'Palæobiologica,' ii. p. 56). Sedgwick Mus., Cambridge.

*Fig.* 3. *a*, cephalothorax; *b*, underside of same, showing maxillipedes and sternum. Holotype, Geol. Surv. Museum, 1215 A.

*Fig.* 4. Cephalothorax (underside, showing sternum). Sedgwick Mus., Cambridge.

(All figs. × 2 diam.)

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* This specimen was lent to us for examination by the kindness of Dr. O. Seitz.

## LXVII.—*Descriptions of some new Species of Ants.*

By Horace Donisthorpe, F.Z.S., F.E.S., &c.

### *CERAPACHYINÆ.*

### *Phyracaces hewitti*, sp. n.

☿.—Black, somewhat shining; mandibles, antennæ, cheeks, clypeus, frontal area, neck, legs, ventral surface of petiole, junction of post-petiole and gaster, extreme apex of segments of gaster, tip of same, and sting testaceous. Whole body punctured with rather deep, round, fairly close punctures. Longer and shorter yellow suberect hairs scattered fairly evenly over the body, but more numerous at apex of gaster. Pubescence *nil.*

*Head* longer than broad, a little broader in front than behind, feebly rounded in front, slightly sinuate before posterior angles, which are somewhat strongly pointed; *occipital border* deeply concave, with a well-marked margin which is continued round posterior angles to the gula; *eyes* large, round, convex, situated in centre of sides of head; *mandibles* slightly concave externally, with blunt points, a very finely-denticulate terminal border; *clypeus* very short; carinæ of *cheeks* well marked; *frontal carinæ* strongly raised with sharp edges, converging abruptly at base, and enclosing a deep round fovea; *antennæ* rather long; *scape* a little longer than half the head, narrow at base and considerably thickened at apex; *funiculus* thickened before apex, none of the joints transverse but gradually increasing in length, with last joint tapering to a point, and as long as the two preceding taken together. *Thorax* about twice as long as broad, subrectangular from above, convex, slightly contracted in middle, distinctly margined anteriorly and more feebly posteriorly, without trace of dorsal sutures; *petiole* subrectangular and convex above, about as long as broad, slightly broader behind, base and lateral borders margined, the lateral borders ending in a small turned-up point at posterior angles, armed on the narrow ventral surface with a blunt tooth-like triangular projection facing forward; *post-petiole* longer and slightly broader than petiole, longer than broad, convex above with rounded sides and apex, anterior border margined and with slightly projecting anterior angles, in profile a suture and groove divide the upper and lower halves, and the ventral surface is furnished anteriorly with a short blunt tooth directed forwards. *Gaster* with first segment longer and broader than post-petiole, about as long as broad, rounded at sides and broadest a little beyond middle; *pygidium* subcircular, with very indistinct little teeth at sides. *Legs* slender, somewhat compressed. *Long.* 5·8 mm.

♂.—Black; antennæ, mandibles, legs, apical margins of gaster and tooth of petiole testaceous, coxæ and femora darker; body clothed with more or less decumbent longer and shorter yellow hairs, which are more abundant on the gaster.

*Head* round, about as broad as long, including *eyes*, which are very large, oval and convex; *ocelli* well developed; *mandibles* well developed, triangular, striate at base, armed with three or four teeth on terminal border, the apical one being longest and bluntly pointed; *clypeus* very prominent, raised, convex, subtriangular, rounded at sides and truncate at base, coarsely reticulate; *frontal area* shallowly excavated, smooth, with a few raised ridges; *frontal carinæ* widely separated, with sharp raised edges, interspace strongly but less closely reticulated than clypeus; *occiput* and rest of head reticulated like clypeus; *antennæ* short and stout, not reaching anterior border of scutellum, scape very short, glabrous; *funiculus* with 1st and 2nd joints glabrous, 3rd to 12th covered with a short suberect yellowish pubescence; 1st joint shorter than scape, 2nd joint very short and strongly transverse, 3rd to 11th longer than broad, of about equal length and breadth, 12th a little longer than 11th, slightly tapering to apex. *Thorax*: *pronotum* transversely reticulate; *mesonotum* longer than broad, longitudinally reticulate; *Mayrian furrows* well marked; *scutellum* transverse, raised above the level of the metanotum and epinotum, furnished with raised, not very close, longitudinal ridges, and armed posteriorly with two fairly long teeth; *epinotum* longer than broad, narrowed posteriorly, the dorsal surface considerably longer than the declivity, strongly and coarsely reticulate. *Petiole* pedunculate, node coarsely reticulate, about as long as broad, rounded above, convex, higher than post-petiole, furnished at base of ventral surface with a small blunt tooth-like projection facing downwards; *post-petiole* transverse, broader than petiole, sides more rounded in front than behind, faintly reticulate and granularly punctate; *gaster* very finely granulately punctured, with sides gradually narrowed to apex, broadest before middle; *pygidium* bluntly pointed.

*Wings*: *fore wing* with one closed cubital cell. *Legs* moderate. *Long.* 6·2–6·9 mm.

Described from two workers and two males taken by Mr. J. Hewitt at Kuching, Sarawak, in 1906–7. Ex Coll, Cameron. Types in Brit. Mus,

## *PONERINÆ.*

### *Platythyrea thwaitesi*, sp. n.

♀.—Reddish brown; the antennæ and legs lighter than the body, with the usual pruinose surface, very finely and densely punctured, but the larger superadded punctures, generally present in this genus, almost wanting; eyes dark brown, side-borders of frontal carinæ narrowly brown.

*Head* oblong, feebly rounded at sides, slightly broader in front, posterior angles rounded, posterior border feebly excised; *mandibles* long, curved, with eight distinct teeth to terminal border, apical tooth long and pointed; *antennæ* long, scapes long and robust, extending by about one-fifth of their length beyond the posterior angles of the head; *funiculus* slightly broader in middle, second joint longer than first and third, apical joint finely pointed; *clypeus* large, convex, with rounded entire anterior border, and distinct posterior suture; *frontal carinæ* very prominent, fused posteriorly, with distinct lateral lobes, and a shallow excavation in the centre; *frontal furrow* traceable as a very faint line a little beyond the apical half of the head; *eyes* moderate, rounded, nearly flat, situated at sides on anterior half of the head; *ocelli* very small and faint. *Thorax* narrow, slightly compressed at sides; *pronotum* longer than mesonotum, promesonotal suture semicircular, clearly defined; *mesonotum* slightly broader than long; *scutum* of mesonotum marked with two shallow, but distinct, fine longitudinal lines arising from the suture of the *præ-scutellum*, which is narrow; *scutellum* round, flat; *metanotum* narrow, with deep sutures; *epinotum* with dorsal surface about equal to its declivity in length, declivity distinctly but shallowly excavated. *Legs* long. The right *hind wing* only present. *Petiole* long, narrow, looking flat from above, in profile the dorsal surface is rounded, sloping down and angled anteriorly, abruptly cut off posteriorly before the junction with the post-petiole, the cut-off part distinctly excavated with sharp edges, the ventral surface is furnished at base with a distinct projecting rounded keel. *Post-petiole* as long as broad, but narrowed in front and slightly broader at apex than gaster, and not separated from it by a constriction. *Gaster* with first segment about as long as post-petiole, the remaining segments short and telescoped into it; *pygidium* furnished with a few short fine hairs; sting small. *Long.* 8·4 mm.

Described from a single female taken by Dr. Thwaites in Ceylon, and presented to the British Museum in 1867. Type in Brit. Mus.

### PSEUDOMYRMINÆ.

### *Tetraponera poultoni*, sp. n.

☿.—Black; mandibles, antennæ, tibiæ, tarsi, articulations of the legs and apex of segments of gaster yellowish brown; scapes, tibiæ and tarsi lighter, palpi yellow, femora and teeth of mandibles dark brown. Body clothed with very fine short decumbent yellowish-grey pubescence, and a few scattered yellow hairs, longer and more abundant on the clypeus and apex of the gaster. Head and thorax dull, finely rugosely punctured; petiole, post-petiole, and gaster somewhat shining and minutely coriaceous.

*Head* a little longer than broad, slightly widened behind, with rounded posterior angles; *clypeus* with five small teeth on anterior border, the central one blunt, broader and longer than the other four; *eyes* very large, prominent, oblong-oval, situated on the posterior half of the head; only the two basal *ocelli*, which are small, visible; *mandibles* shining, striate, and with a few scattered punctures. *Thorax*: upper surface flat, bordered very distinctly throughout as far as the declivity of the epinotum, where it becomes less evident and eventually disappears; *pronotum* broader than long, with distinct but rounded shoulders; *mesonotum* distinctly defined, semicircular anteriorly, almost straight posteriorly, slightly convex, and sloping towards the metanotum; *metanotum* very indistinctly defined, the posterior suture only represented by a slight semicircular furrow; *epinotum* long, flat, the declivity gradually rounded; *petiole* distinctly pedunculate, with upper surface convex and rounded longitudinally, much narrowed anteriorly, broadest behind middle, abruptly contracted posteriorly, with very sharp distinct edges, the underside is wedge-shaped, the ventral surface is sharp and much narrower than the basal surface, and has a small tooth at base directed forward and a larger one at apex directed backward; *post-petiole* pointed anteriorly, broadest behind middle, thence contracted to junction with the *gaster*; *gaster* elongate, first segment longer and broader than the rest, broadest behind middle and slightly contracted to apex; *pygidium* strongly pointed. *Femora* inflated in the middle above and below, but laterally compressed. *Long*. 7·5 mm.

This species is related to *T. mocquerysi*, André, and *T. anthracina*, Santschi, but, besides being a larger and more robust insect, the shape and construction of the petiole will at once separate it.

Described from a worker which had been ejected from an ant-lion's pit in Uganda, and found by Mr. J. E. M. Mellor on October 10, 1928. Type in the Hope Department, Oxford University Museum. I have named this species in honour of my friend, Professor E. B. Poulton, F.R.S., &c., who had asked me to identify this and other species of ants taken at the same time.

### *Tetraponera scotti*, sp. n.

☿.—Head shining, oblong-oval, black; jaws, except part of base which is blackish, lobes of frontal carinæ, and antennæ, except two last joints of funiculus which are dusky, yellowish red.

*Head* alutaceous with very fine small scattered punctures; *frontal furrow* fine but traceable to vertex; *eyes* moderate, round-oval; *ocelli* wanting; *mandibles* punctate and striate, furnished with short yellow bristle-like hairs; *antennæ* with *funiculus* considerably thickened at apex, almost forming a three-jointed club. *Length* of head without jaws 69 mm.; breadth 0·525 mm.

♀.—Shining black, elongate; body clothed with very fine scattered short decumbent yellow pubescence which is more noticeable on the gaster. Whole body distinctly but finely alutaceous and with fine scattered punctures.

*Head* long, oblong, almost parallel-sided, truncate in front, posterior angles rounded; *jaws* yellowish red, except base and two apical teeth which are black, punctate, striate, and furnished with scattered fairly long yellow bristle-like hairs; *clypeus* rather strongly punctured and furnished at apex with several small teeth; lobes of *frontal carinæ* yellowish red; *cheeks* and region of the *frontal furrow* longitudinally striate; *vertex* and *occiput* more shining than anterior part of head; *frontal furrow* traceable as far as centre of head between eyes; *eyes* large, oblong-oval; *ocelli* distinct; (*antennæ* missing, probably similar in shape and form to those of ☿). *Thorax* with the punctures larger and more scattered than those of head; *shoulders* rounded; *petiole*, *post-petiole*, and *gaster* more finely punctured than thorax; *petiole* triangular above, broadest posteriorly, with blunt posterior angles, higher than post-petiole; *post-petiole* rounded, globular, broadest posteriorly; *gaster* elongate, narrow, apex furnished with long yellow hairs; *sting* long. *Legs* stout, but fairly long; *femora* incrassate; *tarsi* larger than tibiæ. *Long.* 6 mm.

Described from the head of a ☿ and an entire ♀ taken in Abyssinia by Dr. Hugh Scott, in Jem-Jem Forest (8000–9000 ft.), September 1926. The head of the ☿ was found clasped in the legs of the ♀, and the other parts of the ☿ were somehow unfortunately detached and lost.

## *MYRMICINÆ.*

### *Ocymyrmex turneri*, sp. n.

☿.—Shining, dark blackish brown, funiculi of antennæ, tibiæ, tarsi, articulations of the legs, mandibles (except external border and teeth, which are black), and anterior border of cheeks testaceous. Clothed with longer and shorter scattered white hairs which are considerably less numerous than in *O. barbiger*, Emery. The serial hairs on the clypeus are curved over the mandibles, those on the mandibles are curved over the mouth, and those behind the mentum, the ammochætæ, are curved forwards.

*Head* about as broad as long, not so broad as in *O. barbiger*, especially at base where it is distinctly contracted behind eyes, finely striate, longitudinally on cheeks and front, and curved inwards from eyes and transversely at base; there is no cross-striation, or reticulate sculpture, as in *O. barbiger*; *clypeus* somewhat convex, slightly projecting in centre of anterior border, the projection being faintly bidentate; *mandibles* deeply striate, more so than in *O. barbiger*, armed with five strong teeth, the apical one longest and curved; *eyes* convex and slightly more projecting than in *O. barbiger*; *frontal carinæ* with smaller lobes, and narrower *frontal area* than in that species; *antennæ* with long scapes projecting further beyond the posterior angles of the head, and the *funiculus* less thickened towards the apex than in *O. barbiger*, first joint not as long as the second and third taken together. *Thorax* contracted in middle with sutures only faintly indicated at the sides, dorsal surface almost entirely smooth and impunctate, faintly transversely striate on epinotum, the sides of the pronotum with faint, widely separated, longitudinal striæ, the rest of the thorax with sides more strongly striate, with widely separated, very oblique striæ (in *O. barbiger* both the dorsal and lateral surfaces of the thorax are strongly striate). *Petiole* with peduncle shorter and less narrowed anteriorly than in *O. barbiger*, the node almost smooth, whereas in the latter species it is strongly striate transversely; *post-petiole* narrower and almost smooth, while in *O. barbiger* it is distinctly transversely striate; *gaster* smooth and shining, the first segment, seen from above, evenly convex from the base, not sub-pedunculate (this character separates *O. turneri* from all the other species of the genus except *O. barbiger*). *Legs* long and slender. *Long.* 5 mm.

Described from a single ☿ taken by Mr. R. E. Turner at Walvis Bay, S.W. Africa, on December 1, 1927. Type in Brit. Mus.

This species is allied to *O. barbiger*, Emery, but is darker in colour, smaller, much less strongly sculptured, and considerably more shining, besides the other differences pointed out in the description.

## *FORMICINÆ.*

### *Camponotus* (*Tanæmyrmex*) *ligea**, sp. n.

*Worker major.*—Black, shining; legs (except first three joints of the tarsi, which are dark brown), coxæ, articulations of scape and funiculus red; funiculus dark brown. Body furnished with scanty, widely scattered, outstanding yellow hairs, and very minute decumbent yellow hairs.

*Head* triangular, slightly excised posteriorly, broadest behind eyes but a little before occiput, posterior angles rounded; *mandibles* striate, armed with five teeth of about equal length; *clypeus* distinctly carinate, broadest at apex, narrowed to base, anterior border produced and bluntly denticulate, finely and very evenly shagreened, with a few scattered shallow punctures, rest of head even more finely shagreened, with smaller and somewhat closer scattered punctures; *frontal area* small, transverse; *frontal carinæ* reaching to middle of eyes, converging in front and slightly diverging behind with a row of punctures along their internal rims; *frontal furrow* fine and shallow, not as long as frontal carinæ, terminated at base by two shallow foveæ placed one behind the other; *eyes* large, round; *ocelli* wanting; *antennæ* fairly long; *scape* somewhat compressed, narrowed and curved at base, slightly thickened towards apex, extending beyond occipital border by about four times its breadth; *funiculus* covered with thick erect pubescence. *Thorax* considerably longer than broad, and considerably narrower than head; *pronotum* about as long as broad, narrowed in front and broadest behind middle, narrowly margined anteriorly; *mesonotum* shorter than pronotum; *metanotum* narrow, posterior border faintly indicated; *epinotum* longer than mesonotum and metanotum taken together, dorsal surface longer than the somewhat abrupt declivity; *scale* convex in front, flat behind, longer than broad, narrowed at apex and bluntly pointed, almost smooth. *Gaster* longer than broad, faintly striate transversely, convex, rather abruptly pointed at apex. *Legs*: *femora* and *tibiæ* compressed, tibiæ with decumbent hairs beneath. *Long.* 9 mm.

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* "Ligea" is the name of a wood-nymph in classical literature, and is chosen for this species in allusion to the specimens having been found in wood.

*Worker minor.*—Head and gaster black, thorax and scale chestnut-brown, legs and articulations of scape and funiculus red. Sculpture and pilosity as in the worker major.

*Head* longer than broad, slightly broader behind than in front, broadest before occipital border; *clypeus* more strongly carinate; *scape* extending beyond the occipital border by more than half its length; rest as in the worker major. *Long.* 6 7 mm.

Described from one worker major and three worker minors, taken by Dr. H. Scott in Abyssinia, from an ants' nest in a rotten tree-trunk on Mt. Chillálo, ca. 9000 ft., on November 12, 1926. Types in Brit. Mus.

The above species is probably near to *Camponotus* (*Tanæmyrmex*) *natalensis*, Smith, but is a very considerably smaller and more compact insect. The legs are shorter in proportion, and the body more shining, &c.

## LXVIII.—Eurytemora thompsoni, *A. Willey, a new European Record.* By A. G. Lowndes.

### *Eurytemora thompsoni*, A. Willey.

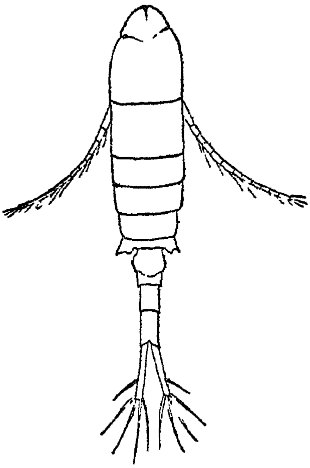
A. Willey, "Distribution of Copepoda in Canadian Waters," Contrib. Canadian Biol. (new series) vol. i. p. 314, fig. 7, Toronto, 1923.

*Female.*—Three adults gave the following measurements:—

| | 1.<br>mm. | 2.<br>mm. | 3.<br>mm. |
|---|---|---|---|
| Length of animal without setæ .... | 1·14 | 1·11 | 1·23 |
| " body .................. | ·74 | ·74 | ·77 |
| Greatest width of body............ | ·26 | ·28 | ·27 |

Seen dorsally the body appears decidedly elongated, its greatest length being nearly three times the greatest breadth. The first thoracic somite is elongated and nearly twice the length of the second.

The fifth thoracic somite is not extended laterally to form wing-like processes comparable to those of *E. affinis* as shown by Schmeil, but the outer tips bear minute spines. In the living specimens all the somites are symmetrical. The genital segment is about as long as it is broad and nothing like as long as the next two somites combined. It bears minute marginal spines, but these are very difficult to see even under the high powers of the microscope. The anal segment is decidedly elongated and towards the posterior end its dorsal and ventral surfaces are densely crowded with minute spinules.



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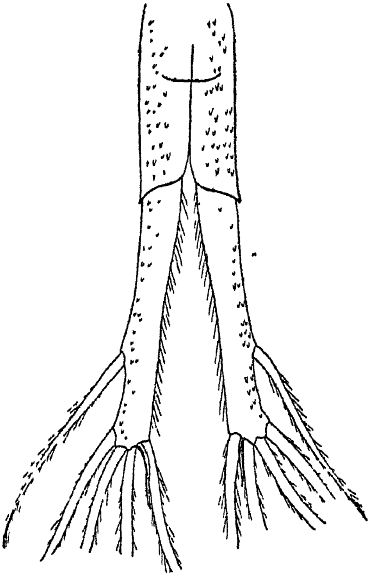

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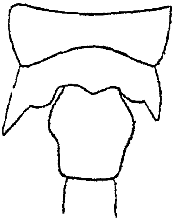

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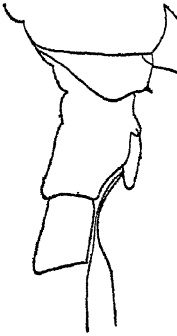

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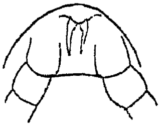

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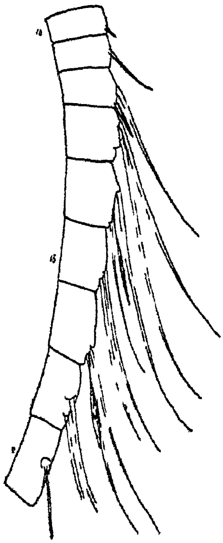

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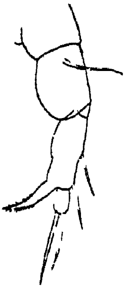

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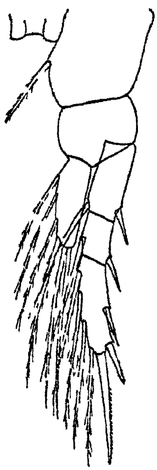

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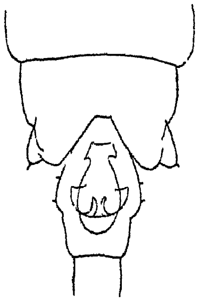

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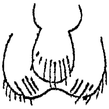


10.

### EXPLANATION OF FIGS. 1–10.

*Eurytemora thompsoni*, A. Willey, ♀.

1. Whole animal, viewed dorsally.
2. Last two thoracic segments and genital segment, showing processes of the the last thoracic segment rather exceptionally produced.
3. Anal segment and caudal rami.
4. Rostral filaments.
5. Antennule, segments 10–18.
6. Last thoracic segment and genital segment, viewed laterally, showing attachment of spermatophore.
7. Last thoracic segment and genital segment, viewed ventrally, showing the seminal receptacle.
8. Fifth swimming foot.
9 First swimming foot.
10. Upper lip.

The anal segment overlaps the caudal rami, giving the suture a conspicuous oblique appearance and forming on the outer edge of the rami a well-marked lappet.

The rami are not conspicuously elongated. They are about seven times as long as broad and only slightly longer than the anal segment. The inner edge is densely setose, while towards the outer edge both the dorsal and ventral surfaces are crowded with spinules.

The position of the lateral seta is two-thirds along the rami.

The terminal setæ are rather elongated, and are quite as long as the rami, if not longer.

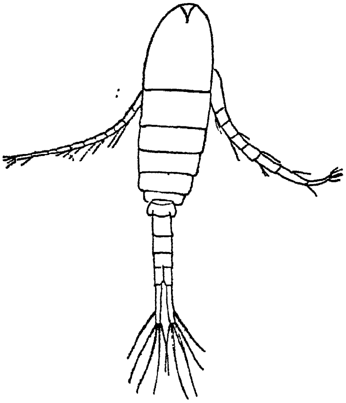
The rostral filaments are rather stout, while the upper lip has a prominent median lobe fringed with long hairs and broad lateral lobes.

The antennules are decidedly long, reaching when reflexed as far as the posterior end of the genital segment. They are abundantly supplied with setæ, some of which are again decidedly elongated.

The seminal receptacle is produced behind to form a distinct lappet, which is very pronounced when viewed laterally.

*The Fifth Foot.*—This is certainly the chief distinguishing characteristic.

The first joint bears a long seta. The penultimate joint is comparatively long and is quite conspicuously constricted in the middle. The unguiform process on the inner edge is bent and finely setose on both its inner and outer edges. The outer edge bears two long setæ which do not resemble spines in any way.



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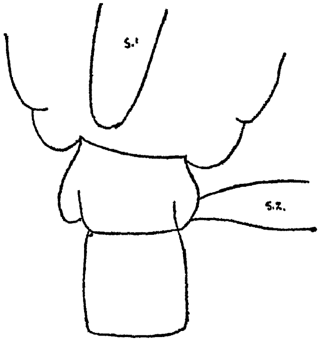

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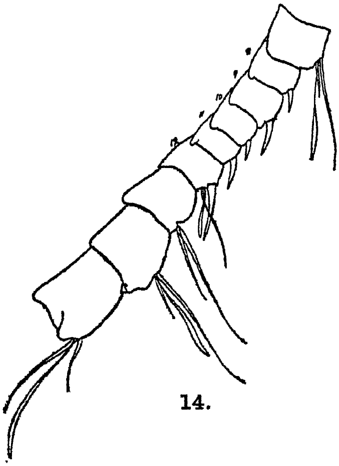

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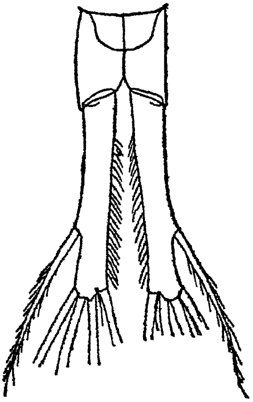

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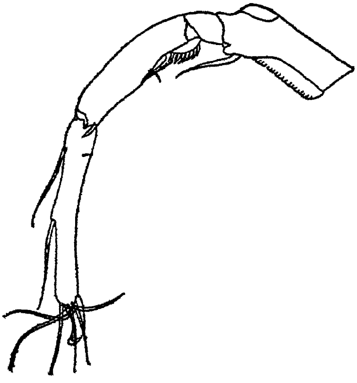

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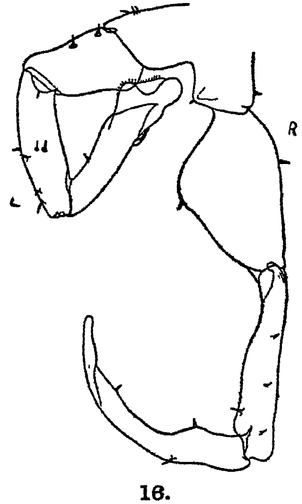

16.

### EXPLANATION OF FIGS. 11–16.

*Eurytemora thompsoni*, A. Willey, ♂.

11. Whole animal, viewed dorsally.
12. Last thoracic segment and genital segment. S. 1, spermatophore inside the body; S. 2, spermatophore carried on the fifth swimming foot.
13. Anal segment and caudal rami.
14. Right antennule, showing segments 7–15.
15. Right antennule, showing the last three joints.
16. Fifth swimming foot.

The terminal joint is small and globular, and bears two long subequal setæ.

*Male.*—Two adult males gave the following measurements:—

| | 1. mm. | 2. mm. |
|---|---|---|
| Length of animal without setæ ........ | 1·04 | 1·02 |
| „ body ...................... | ·64 | ·65 |
| Greatest width of body ............. | ·22 | ·23 |

The animal is more elongated and attenuated than the female.

The last thoracic segment is rounded at the corners and not expanded laterally in any way.

The anal segment is only slightly elongated and does not bear spines. The suture between it and the caudal rami is similar to that in the female.

The rami are not more elongated than in the female. They are about seven times as long as broad and bear on their inner edges numerous setæ, but the upper and under surfaces of their outer edges bear no spinules.

The terminal setæ are elongated and are much longer than the rami.

The left antennule is more elongated than in the female, reaching back beyond the distal edge of the second tail-segment. The right antennule bears spines on segments 8–12. The spines on segments 8 and 10 are equal and are half the length of those on segments 9 and 11, which are again practically equal.

The spine on segment 12 is nearly twice the length of that on segment 11.

The teeth on the proximal scale of segment 19 are very long and are curved distalwards.

The terminal segment is long and bears a conspicuous curved process near the tip.

*Fifth Swimming Foot.*—The whole appendage is provided with numerous spinules.

The *right* basal joint is expanded on its inner edge, but it is rounded and not angular. The greatest width is decidedly less than the length. Endopodite 1 is elongated, while endopodite 2 is not dilated near the base.

The *left* basal joint is produced on its inner edge into a rounded process. This process, however, occurs at the proximal end of the joint and not near the middle. The joint is quite definitely longer than broad.

Endopodites 1 and 2 are elongated. The tip of the latter ends in a flat bilobed process fringed at its edge with numerous hairs.

It is not at all unusual to see a spermatophore attached to this terminal joint.

## *Occurrence.*

I first came across this interesting species in the Wide-Water, South Lancing, Sussex, in June 1931, while doing some ecological work with Mr. A. E. Ellis.

The station in question consists of some large shallow pools which are not directly connected with the sea, though they contain brackish water and a typical brackish-water association.

The water in the pools was found to have a pH of 8·9 and a salinity of 2·49 per cent. sodium chloride *.

The pools contained a great deal of mud on the bottom and masses of floating *Chætomorpha Linum* (Müll.) in which the following additional Crustacea were found:—*Palæmonetes varians*, *Idothæa viridis*, *Corophium grossipes*, *Gammarus locusta* and *G. duebeni*, *Idya furcata*, *Cyclopina gracilis*. On examining the Eurytemora I was unable to refer it to any British or foreign species, and at once sent specimens to Dr. Robert Gurney. Unfortunately, Dr. Gurney was unable to give the matter any attention at the time. He suggested that I was dealing with one of the many forms of *E. affinis*, Poppe, and kindly sent me some proof-sheets of the part relating to that species in his Ray Society 'Monograph of the British Fresh-water Copepoda' (not yet published).

He was also good enough to send me specimens of three of his *E. affinis* forms.

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* The salinity was determined by Mr. J. H. Cooper, Lancing College. The pH was taken at the time of collecting.

I also sent specimens to Dr. S. Smirnov, with whom I had had a considerable amount of recent correspondence on Eurytemora, and who had recently described a species *E. composita*, Keiser, with which my specimens had some affinities.

Dr. Smirnov at once diagnosed the species as being identical with one he had recently obtained from the Sea of Okhotsk, which he again believed to be identical with *E. thompsoni*, A. Willey.

I then sent specimens to Prof. Arthur Willey, who went into the matter fully and confirmed Dr. Smirnov's diagnosis.

### *Diagnosis.*

The species is most closely associated to *E. hirundoides*, Nordpuist, as described by Sars in 'Crustacea of Norway.' The fifth foot, however, in both sexes is quite different, nor can it be referred to any of the forms of *E. affinis* sent by Gurney.

### *Distribution.*

The species was originally described by Willey from the contents of the stomach of a shad (*Alosa sapidissima*) caught in a weir near the low-tide level at Scotsman Bay, Nova Scotia. So far then the occurrence of this species at South Lancing constitutes a new European record, and the only other records are from the Sea of Okhotsk and Nova Scotia—truly a rather remarkable distribution.

## LXIX.—*Notes on Flatfishes (Heterosomata).—I. Notes on Flatfishes of the Family* Bothidæ *in the British Museum, with Descriptions of Three new Species.* By J. R. Norman.

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In this and succeeding papers it is proposed to publish notes and preliminary descriptions of new species of flatfishes, in preparation for a catalogue of the order which is now being compiled. I have already published detailed reports on the Heterosomata of Australia * and India †, and propose to deal with a number of species from China, Japan, and the Hawaiian Islands in the second or third paper of this series.

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* Biol. Res. 'Endeavour,' v. 1926, pp. 219–308, 15 figs.

† Rec. Indian Mus. xxix. 1927, pp. 7–47, pls. ii.–vii., 12 text-figs.; xxx. 1928, pp. 173–215, pls. iv.–vii., 30 text-figs.

## *PARALICHTHINÆ.*

### *Pseudorhombus natalensis*, Gilchrist.

Barnard[*] unites this species with *P. arsius* (Hamilton-Buchanan) [=*P. russellii* (Gray)]. Judging by the single co-type in the British Museum, however, the two species are quite distinct, and may be distinguished as follows:—

| | |
|---|---|
| I. Eye 4⅔ to 7 in head; maxillary extending at least to below middle of eye; strong canine teeth present anteriorly in both jaws; 69 to 80 scales in lateral line; dorsal 72–80; anal 54–62 .................. | *arsius.* |
| II. Eye 3⅓ in head; maxillary not reaching middle of eye; teeth scarcely enlarged anteriorly; 58 scales in lateral line; dorsal 70; anal 52 .................. | *natalensis.* |

## *BOTHINÆ.*

### *Citharichthys arenaceus*, Evermann & Marsh.

*C. rathbuni*, Ribeiro, and *C. evermanni*, Meek & Hildebrand, are synonyms of this species, which has now been recorded from the West Indies southwards to Bahia. It is close to *C. spilopterus*, Günther, differing chiefly in the deeper body, smaller head, with nearly straight upper profile, larger eye, and fewer dorsal and anal rays.

### *Arnoglossus microphthalmus* (Von Bonde).

This species, originally described as *Læops*, proves to be an *Arnoglossus* of the subgenus *Anticitharus*. It differs, however, from all other known species in the somewhat smaller scales, and in the shorter arch of the lateral line.

### *Engyprosopon fijiensis*, sp. n.

*Rhomboidichthys* sp. (?), Günther, Shore Fishes 'Challenger,' p. 36 (1880).

Depth of body nearly twice in the length, length of head 3½. Snout longer than eye, diameter of which is about 5 in length of head and somewhat greater than the width of the concave interorbital space; lower eye in advance of upper. No rostral or orbital spines. Maxillary extending to below anterior edge of eye, length 2¼ in that of head. Teeth uniserial in both jaws. Gill-rakers "palmate" (short, broad, strongly spinulate); 8 on lower part of anterior arch. About 60 scales in lateral line. Dorsal 71. Anal 61. Pectoral of ocular side with 10 rays, length about ½ that of head. Greyish brown, with numerous paler and darker spots and ocelli; a dark blotch on hinder part of lateral line; median fins variegated with paler and darker.

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[*] Ann. S. Afric. Mus. xxi. 1925, p. 388.

*Hab.* Fiji Islands.

*Holotype.*—83 mm. B.M. reg. no. 79. 5. 14. 89.

Apparently related to *E. cocosensis* (Bleeker) and *E. xenandrus*, Gilbert, but readily distinguished from both by the palmate gill-rakers. In this and other characters it resembles *Arnoglossus intermedius* (Bleeker), a species of problematical generic position, and it should perhaps be placed in the genus *Arnoglossus.* Unfortunately, the type is small and rather poorly preserved, and the sex cannot be determined.

### *Bothus mellissi*, sp. n.

*Rhomboidichthys* sp., Melliss, St. Helena, p. 109 (1875).
*Platophrys podas* (non Delaroche), Cunningham, Proc. Zool. Soc. London, 1910, p. 113.

Close to *B. podas* of the Mediterranean and adjacent parts of the Atlantic. Depth of body $1\frac{1}{2}$ to nearly $1\frac{2}{3}$ in the length, length of head $3\frac{5}{6}$ to $4\frac{1}{6}$. Upper profile of head steeply sloping in front of eyes in males, but less vertical than in *B. podas.* Diameter of eye 4 to $4\frac{2}{3}$ in length of head; interorbital width $1\frac{3}{4}$ to $2\frac{1}{4}$ times (adult male) or $1\frac{1}{4}$ to $1\frac{3}{5}$ times (adult female) diameter of eye; anterior edge of upper eye above posterior edge or hinder part of lower. Maxillary extending to below anterior edge or anterior part of eye, length $3\frac{1}{4}$ to 4 in head. 9 or 10 gill-rakers on lower part of anterior arch. 86 to 90 scales in lateral line. Width of arch of lateral line $4\frac{4}{5}$ to $5\frac{1}{4}$ times in straight part. Dorsal 92–98. Anal 70–75. Pectoral of ocular side with 11 or 12 rays.

*Hab.* St. Helena and Ascension Islands.

Described from twelve specimens, 158 to 225 mm. in total length.

*Holotype.*—♀, 225 mm. B.M. reg. no. 67. 10. 8. 54.

Distinguished from *B. podas* by the deeper body, smaller eye, and somewhat wider interorbital space. The related *B. ocellatus* from the Western Atlantic has only 75 to 78 scales in lateral line, 79 to 91 dorsal rays, and 59 to 68 anal rays.

### *Bothus mancus* (Broussonet).

I have examined one of the specimens from the Clarion Islands on the Pacific coast of Mexico, identified by Jordan and McGregor* as *B. leopardinus* (Günther), the type-locality of which was unknown. This is only 98 mm. in total length, but undoubtedly belongs to the species described by Broussonet from Tahiti, which has been shown to be identical with Bleeker's *Rhombus pavo*. *Bothus mancus* thus extends from the Indian Ocean across the Pacific to the west coast of Mexico. The true *B. leopardinus*, probably also found on the Pacific coast of Mexico and Central America, has fewer dorsal and anal rays, more slender gill-rakers, and the upper eye farther forward than in *B. mancus*.

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* Rept. U.S. Fish. Comm. xxiv. (1898) 1899, p. 284.

### *Læops natalensis*, sp. n.

*Lambdopsetta kitaharæ* (non Smith & Pope), Von Bonde, Rep. Fish. Mar. Biol. Surv S. Africa, ii. (1921) 1922, Spec. Rep. i. p. 9; Barnard, Ann. S. Afric. Mus. xxi. 1925, p. 393.

Depth of body $2\frac{1}{5}$ to $2\frac{1}{4}$ in the length, length of head 5 to $5\frac{1}{3}$. Upper profile of head and body markedly convex above and behind eyes. Diameter of eye about 3 in length of head; lower eye a little in advance of upper, which is very close to edge of head. Maxillary extending to below anterior edge of eye, length a little more than 4 in that of head; teeth in narrow bands; mostly confined to blind side of jaws. 5 or 6 gill-rakers on lower part of anterior arch. About 100 scales in lateral line. Dorsal 97–99; origin above posterior nostril of blind side; two anterior rays detached from remainder of fin; none of the rays prolonged. Anal 75–77. Pectoral of ocular side with 14 rays, length about $1\frac{1}{2}$ in that of head. Caudal rounded. Yellowish brown; median fins dusky towards their margins.

*Hab.* Coast of Natal, 180 to 230 fathoms.

*Holotype.*—135 mm. B.M. reg. no. 1922. 3. 27. 19. A paratype (115 mm.) in the collection of the Government Marine Survey also examined *.

Close to *L. kitaharæ* (Smith & Pope), from Japan, differing in the deeper body, larger head, more convex anterior profile, etc.

### *Læops nigromaculatus*, Von Bonde.

In this species the dorsal fin commences above the anterior nostril of the blind side instead of above the posterior nostril as in all other species, and the first two rays are not detached from the remainder of the fin; the second and third dorsal rays are a little prolonged. In other respects it is a typical *Læops*, and may be retained in that genus.

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* I am greatly indebted to Mr. C. Von Bonde for the loan of this specimen.

## LXX.—*Notes on Flatfishes (Heterosomata).*—II. *The Generic Name of the Turbot and Brill.* By J. R. Norman.

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In most ichthyological literature the turbot and brill are respectively known as *Rhombus maximus* and *Rhombus lævis.* From the first century A.D., and probably even earlier, these two fishes have been called *Rhombus,* and Kyle *, after a survey of the relevant literature, concludes that this name should be retained. Unfortunately, strict adherence to the rules of the International Commission on Zoological Nomenclature renders a change necessary, and it seems certain that, in order to comply with the law of priority, *Scophthalmus* must replace *Rhombus* as a name for this genus. In view of the fact that *Rhombus* has not only been used for two totally different groups of fishes, but also more than once in the Mollusca, suspension of the rules in this case would tend to lead to greater confusion than would the use of the unfamiliar name *Scophthalmus,* and such procedure would seem to be inadvisable.

The following generic names have been used at one time or another for the turbot and brill group:—*Pleuronectes, Rhombus, Bothus, Scophthalmus, Psetta, Passer,* and *Lophopsetta.* These may be dealt with in chronological order.

1. Pleuronectes, Linnæus, Syst. Nat. ed. 10, 1758, p. 268. Genotype, *Pleuronectes platessa,* Linnæus (see below).

Jordan and others have attempted to transfer this name from the plaice to the turbot †, but this view has been finally disposed of by Opinion 68 of the Commissioners. Their decision was that Fleming, in 1822, selected *platessa* (*i. e.*, the plaice) as the type of *Pleuronectes,* and that in 1828 he reversed his decision and used *Pleuronectes* for *maximus* (turbot) and *rhombus* (brill).

2. Rhombus (Klein) Walbaum, Artedi Ichth. (3) ed. 2, 1792, p. 582. Genotype, *Pleuronectes rhombus,* Linnæus (see Jordan, Genera Fish. i. 1917, p. 38).

There are two arguments in favour of not accepting this genus under the rules. Firstly, Opinion 21 definitely states that the genera of Klein (1744), reprinted in condensed form

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* Rep. Danish Ocean Exped. 1908–1910, ii. A. 1, 1913, pp. 8–10.

† See Jordan & Goss, Rep. U.S. Fish Comm. xiv. (1886) 1889, p. 254. Jordan and his collaborators were the first in recent times to use *Bothus* for the turbot, afterwards suggesting the use of *Pleuronectes,* and finally transferring their allegiance to *Psetta.*

(but not accepted) by Walbaum, are not available under the Code. Secondly, the name *Rhombus* was used by Costa in 1776* for a genus of molluscs †.

3. Bothus, Rafinesque, Car. n. gen. 1810, p. 53. Genotype, *Bothus rumulo*, Rafinesque (see Jordan, Genera Fish. i. 1917, p. 79).

Kyle ‡ has demonstrated that *Bothus rumulo* is almost certainly the Mediterranean species commonly known as *Platophrys podas* (Delaroche). The other two species included by Rafinesque in his genus *Bothus* (*B. tappa* and *B. imperialis*) appear to belong to *Arnoglossus*. Thus, the name *Bothus* should be used for the genus known as *Platophrys* (=*Rhomboidichthys*) §.

4. Scophthalmus, Rafinesque, Ind. itt. Sicil. 1810, pp. 14, 53. Genotype, *Pleuronectes rhombus*, Linnæus (see Jordan, Genera Fish. i. 1917, p. 82).

Rafinesque was the first author to subdivide the Linnean genus *Pleuronectes*, which then contained all the known species of flatfishes. In his genus *Scophthalmus* he included *Pleuronectes maximus*, Linnæus, *Pleuronectes rhombus*, Linnæus, and a new form, *S. diurus*, Rafinesque, based on a figure by Duhamel, which depicts an unrecognizable flatfish with an abnormal caudal fin. If *Pleuronectes*, *Rhombus*, and *Bothus* are shown to be inadmissible, this is the only valid generic name for the turbot and brill.

5. Rhombus, Cuvier, R. Anim. ii. 1817, p. 222. Genotype, *Pleuronectes rhombus*, Linnæus (see Jordan, Genera Fish. i. 1917, p. 100).

This name is later than *Scophthalmus*, and, even if *Rhombus*, Costa (1776), is invalid, it is preoccupied by *Rhombus*, Lacepède (1800), a genus of fishes of the family Stromateidæ.

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* Elem Conch. p. 225.

† It is doubtful, however, whether Costa's genera are acceptable under the Code. He is certainly not consistently binominal, and it is open to doubt whether he has applied the principles of binary nomenclature.

‡ Rep. Danish Ocean Exped. 1908–1910, ii. A. 1, 1913, p. 10.

§ It may be noted here that *Bothus* has already been used in this sense by Bonaparte:—*Bothus* (non Rafinesque), Bonaparte, Cat. Metod. Pesci Europ. p. 49 (1845). Genotype, *Pleuronectes podas*, Delaroche.

6. Psetta, Swainson, N. H. Fishes etc. ii. 1839, pp. 187, 302. Genotype, *Pleuronectes maximus,* Linnæus (see Jordan, Genera Fish. ii. 1919, p. 203).

This name has been suggested for the turbot by Regan, Jordan, and others. Under the Code it is not invalidated by *Psettus,* Cuvier (1817), but is much later than *Scophthalmus.*

7. Passer, Valenciennes, Voy. 'Venus,' v. Zool. 1855, p. 341. Genotype, *Pleuronectes maximus,* Linnæus (selected by Valenciennes).

Later than *Scophthalmus,* and, in any case, preoccupied by *Passer,* Brisson (1760), a genus of birds.

8. Lophopsetta, Gill, Cat. Fish. E. Coast N. Amer. 1862, p. 51; Proc. Acad. N.S. Philad. xvi. 1864, p. 220. Genotype, *Pleuronectes maculatus,* Mitchill (see Jordan, Genera Fish. iii. 1919, pp. 303–331).

A genus established for the American "window-pane," a close relation of the brill.

Four species of the genus *Scophthalmus* may be recognized, and should be named as follows:—

1. Turbot. *Scophthalmus maximus* (Linnæus).
2. Black Sea Turbot. *Scophthalmus mæoticus* (Pallas).
3. Brill. *Scophthalmus rhombus* (Linnæus) *.
4. Window Pane. *Scophthalmus aquosus* (Mitchill) †.

Should it be considered necessary to group the two species of turbot as a distinct subgenus or genus, based on the absence of true scales, and the unbranched anterior rays of the dorsal fin which are not free from the membrane, the name *Psetta* may be used for such a group, the name *Scophthalmus* being retained for the other two species.

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* There is no justification for the use of the trivial name *lævis* commonly applied to this species.

† Most of the American ichthyologists use the trivial name *maculatus* for this species; *Pleuronectes maculatus,* Mitchill, 1814, however, is preoccupied by *Pleuronectes maculatus,* Schneider, Bloch, 1801.

## LXXI.—*Some Reptiles and Amphibians from S.E. Arabia.*

### By H. W. Parker, B.A.

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In a previous number of these 'Annals'[*] the author described some new species of reptiles collected by Mr. Bertram Thomas during the course of his preliminary exploration of the fringes of Rub'al Khali, inland from Dhufar. On that occasion Mr. Thomas crossed the Qara Mountains from Salalah, and after a short journey into Rub'al Khali returned to his starting-point[†]. In the winter of 1930–31 Mr. Thomas made a second expedition to the same region, making zoological collections in two very different types of country—first, the forested mountains and valleys inland from Dhufar (Qara Mountain region), and, second, the arid, steppe-fringed Rub'al Khali. The desert was crossed from south to north, and the localities mentioned in the following list will be found described in Mr. Thomas's account of his journey[‡].

The herpetological faunas of the two climatic and vegetational zones visited are totally different, and are here treated separately; not a single species is common to the two, and only one genus has a species in both. The Dhufar littoral, with a seasonal rainfall and luxuriant vegetation, has a fauna strongly resembling that of the Savannah provinces of N.E. Africa, whereas the reptiles of the barren desert are specialized in the extreme and of decidedly Palæarctic affinities. Adaptation to the different environmental conditions does not provide an adequate explanation of these different faunistic relationships, and it appears quite possible that the Dhufar fauna is a relic of that which formerly existed from northern Africa to the Indian region, before desiccation destroyed it in most of Arabia and the surrounding countries. The re-population of the desert regions almost undoubtedly took place from the north, and so, by the introduction of animals, not only derived from a different zoogeographical realm, but also adapted to the altered environment, produced the present marked disparity between the faunas of the Rub'al Khali and the Dhufar–Hadramaut littoral.

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[*] Ann. & Mag. Nat. Hist. (10) vi. 1930, pp. 594–598.

[†] See Bertram Thomas, Geograph. Journ. lxxvii. 1, 1931, p. 1.

[‡] *Ibid.* lxxviii. 3, 1931, p. 1.

## A.—QARA MOUNTAINS AND DHUFAR LITTORAL.

### REPTILIA, LACERTILIA.

### Geckonidæ.

### (1) *Pristurus rupestris*, Blanf.

5 specimens: Fuzul (1350 ft.), Ain al Rizat (350 ft.), and In (500 ft.).

### (2) *Pristurus carteri tuberculatus*, subsp. nov.

Co-types: 18 males, females, and young from Ain al Rizat, Milwah Alaud (220 ft.) and Sahalnaut (350 ft.). Numbers 1931. 7. 16. 12–29 in the British Museum.

These eighteen specimens, all collected on the south side of the Qara Mountains at low altitudes, differ from others collected by Mr. Bertram Thomas on the north side of the same range (Bin Ju'ai, 1470 ft., and Quarn Shaibah, 2000 ft.); they have from two to four longitudinal series of widely spaced, enlarged tubercles, or groups of enlarged scales, on the flanks. These tubercles are small, but quite distinct even in very young specimens, and are picked out in white and connected by narrow reddish lines similar to those found on the flanks of *P. carteri carteri* and *P. carteri collaris*. The specimens taken on the north side of the mountains cannot be distinguished from typical specimens of *P. carteri carteri*, and it thus appears that those from the south side represent a distinct littoral race.

The three known races of the species are:—

(a) *P. carteri carteri*, Gray.—No enlarged tubercles on the flanks and no black collar beneath the throat. Type-locality: Masirah Island*. Distribution: Muscat to Dhufar hinterland.

(b) *P. carteri tuberculatus*, subsp. n.—Two to four rows of enlarged tubercles or groups of scales on the flanks; no black collar. Distribution: Dhufar littoral.

(c) *P. carteri collaris*, Steindachner.—No tubercles on the flanks; a black collar beneath the throat. Type-locality unknown. Distribution: Aden to the Wadi-Hadramaut.

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* The locality "Makulla" (= Mokalla) given in the Cat. Lizards Brit. Mus. i. 1885, p. 56, is erroneous.

### Agamidæ.

#### (3) *Agama sinaita*, Heyden.

5 specimens: Jurbayb, Ain al Rizat, and Milwah Alaud. The genus *Agama* is the only one found common to both the Dhufar littoral and the Rub'al Khali, but *A. sinaita* gives place in the desert to a different species, better adapted for life in shifting sand.

### Scincidæ.

#### (4) *Chalcides ocellatus ocellatus* (Forsk.).

1 specimen: Jurbayb.

### Chamadeontidæ.

#### (5) *Chamadeon calcarifer*, Peters.

1 specimen: Milwah Alaud.

## REPTILIA, OPHIDIA.

### Colubridæ.

#### (6) *Coluber rhodorhachis* (Jan).

9 specimens: Mairbon (1600 ft.), Ain (1500 ft.), Airget (1000 ft.), Khiyunt (1750 ft.), Zik (2000 ft.), Wadi Arbot (500 ft.), and Wadi Thidot (500 ft.).

#### (7) *Coluber thomasi*, sp. n.

Holotype, a juvenile female, from Ain, 1500 ft.; collected 7. xi. 30. Number 1931. 7. 16. 68 in the British Museum.

Snout scarcely prominent, blunt. Upper surface of head quite flat. Rostral once and a half as broad as deep, the portion visible from above measuring less than one-third its distance from the frontal; internasals a little shorter than the præfrontals; frontal bell-shaped, much broader than the supraocular, once and a quarter as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal longer than deep; one præocular just touching the frontal, with a small subocular below it; two or three postoculars; temporals 2+3; eight upper labials, the fourth and fifth entering the eye; four lower labials in contact with the anterior chin-shields; posterior chin-shields a little longer than the anterior and widely separated on the median line. Scales smooth, with paired apical pits, in 15 rows at mid-body and on the neck; 13 in front of the vent. Ventrals 158; anal divided; subcaudals 80 pairs + 1.

Pale whitish grey above, with a series of regular black cross-bars extending somewhat on to the ventrals; each cross-bar is rather broader mid-dorsally than laterally and the bars and interspaces are approximately equal. Three broad black bars across the head, separated by narrow light interspaces, one across the nasal region, one between the eyes, and one across the parietals. Thirty-three cross-bars between nape and vent; twenty-two on the tail. Lower surfaces white; a median row of brown spots on the tail anteriorly, the spots alternating with the dorsal cross-bars.

Length from snout to vent 160 mm.; tail 57 mm.

This species appears to be closely allied to *C. variabilis* (Boulenger), with which it agrees in the pholidosis of the head and the low number of ventrals and subcaudals; it differs, however, in having only 15 scale-rows and in its very distinct colour-pattern.

### (8) *Spalerosophis diadema*, Schlegel.

♀, Salalah.

### (9) *Psammophis schokari* (Forsk.).

2 ♀ ♀, Fuzul.

## Micruridæ.

### (10) *Naja haje* (Linn.).

4 specimens: Khiyunt, Al Qutun (2000 ft.), Ahayrkot (450 ft.).

The Egyptian cobra has hitherto been recorded only from the south and west of Arabia; the present, most north-easterly known examples, differ from typical Egyptian specimens in possessing only 19 scale-rows on the neck (which consequently appears to be not dilatable) and a rather higher number of ventral and subcaudal scales. The scale-counts are as follows:—

| | | | |
|---|---|---|---|
| (1) ♂ …… | Sc. 19/20 | V. 220 | C. ? |
| (2) Hgr. ♀ .. | Sc. 19/19 | V. 221 | C. 74 + $n$. |
| (3) Juv. ♂ .. | Sc. 19/19 | V. 216 | C. 80 + 1. |
| (4) Juv. ♂ .. | Sc. 19/19 | V. 217 | C. 79 + 1. |

No increase in the number of scale-rows on the neck is a very rare condition in African specimens, which seldom or never have more than 210 ventrals or 70 subcaudals. Three specimens from El Kubar, S.W. Arabia, show an intermediate condition, having 21 scale-rows on the neck, 200–215 ventrals, and probably more than 70 subcaudals; the only example with an entire tail has 70, and the other two both have more than 60 although a considerable portion of the tip of the tail is wanting. Specimens 1, 3, and 4, above, also differ in having some of the anterior subcaudals single, a condition recalling that of *Naja morgani*, Mocquard. It seems likely that, when more material becomes available, it will be possible to recognize a distinct race in Arabia.

### Viperidæ.

#### (11) *Atractaspis andersoni*, Boulenger.

♀, Aizet (2000 ft.). Sc. 25, V. 254, C. 27.

This species, hitherto known only from the extreme south of Arabia, appears to exhibit a definite sex dimorphism; males have 23 scale-rows and females 25. The scale-counts of the seven specimens examined are :—

| | | | |
|---|---|---|---|
| 3 ♂♂ .... | Sc. 23 | V. 224–243 | C. 29–31. |
| 4 ♀♀ .... | Sc. 25 | V. 219–254 | C. 27–29. |

#### (12) *Echis carinatus* (Schneid.).

Juv. ♂, Zik (2000 ft.).

#### (13) *Bitis arietans* (Merrem).

3 specimens: In, Fuzul, and Sa'arin (1250 ft.).

This is the most northerly record for the puff-adder in Arabia.

## AMPHIBIA, SALIENTIA.

### Bufonidæ.

#### (14) *Bufo dhufarensis*, sp. n.

Holotype, a female, number 1931. 7. 16. 1 in the British Museum, from Milwah Alaud (220 ft.); collected Nov. 1st, 1930.

Head without bony ridges. Snout bluntly rounded, projecting well beyond the mouth, a little longer than the diameter of the eye; canthus rostralis blunt; loreal region almost vertical; interorbital space flat, nearly once and a half as broad as the upper eyelid. Tympanum very distinct, pear-shaped, ¾ the diameter of the eye and separated from it by a very narrow rim. First finger longer than the second. Toes ⅓-webbed; subarticular tubercles single except the distal one of the fourth finger (not toe), which is double; two metatarsal tubercles and a slight tarsal fold. Tarso-metatarsal articulation reaching the anterior border of the eye.

No distinct parotoids; upper surfaces uniformly beset with small, slightly spinous, conical tubercles; belly granular; chest and throat with numerous irregular intersecting plicæ.

Pale brown above, regularly but obscurely motttled with darker; a dark line beneath the canthus rostralis and a vertical dark spot below the eye; fore-arm, tibia, tarsus, and foot indistinctly cross-barred; lower surfaces uniform white.

Length from snout to vent 70 mm.

This species is very closely allied to the N.E. African *Bufo dodsoni*, Boulenger, with which it agrees in the size and disposition of the tympanum, webbing of the toes, digit length, and proportions of the limbs. It differs, however, in its longer, more prominent snout, broader interorbital region, and the absence of parotoid glands.

## B.—Rub'al Khali Desert.

## Reptilia, Lacertilia.

### Geckonidæ.

### (1) *Alsophylax blanfordii*, Strauch.

2 ♂♂, 1 ♀, Uruq Dahiyah (700 ft.), Shéna (1000 ft.), and 'Auda (400 ft.).

### (2) *Ceramodactylus major*, Parker.

2 ♀♀, Kharaiyidi Fasad (850 ft.) and Shéna.

## **Agamidæ.**

### (3) *Phrynocephalus arabicus*, Anderson.

4 ♀ ♀, Kharaiyidi Fasad, Suwahib (600 ft.), and Sanam Turaiga (700 ft.).

### (4) *Phrynocephalus maculatus*, Anderson.

♂, 2 ♀ ♀, Jiddat al Hamsha (900 ft.), Ramlat Shuait (1000 ft.), and Jaub Dhibi (340 ft.).

### (5) *Agama jayakari*, Anderson.

2 ♂ ♂, ♀, and young, Jaub Sufaiya (200 ft.), Shaghra (70 ft.), and Qatar hinterland.

### (6) *Uromastix thomasi*, Parker.

Wadi Hauf (1150 ft.).

## **Varanidæ.**

### (7) *Varanus griseus* (Daud.).

Juv. ♂, Sanam.

## **Lacertidæ.**

### (8) *Acanthodactylus cantoris*, Günther.

The distribution of this species, as hitherto known, was discontinuous, no specimens having been recorded from between Persia and the extreme south of Arabia (Aden to the Wadi Hadramaut). Persian specimens are referable to the subspecies *blanfordii* and Arabian to *arabicus*, the two differing in size and the number of scales across the body. The two specimens collected during the present expedition, and one collected by Mr. Bertram Thomas previously, help to bridge the distributional gap, but do not definitely link the two races; specimens from Bil Ashush and Hailat al Shisur (two localities inland from Dhufar) are relatively small and have few dorsal scales, agreeing closely with *arabicus*, whereas one from Jaub et Izba (in the northern half of Rub'al Khali) is apparently very close to *blanfordi*. The details of the three specimens, tabulated for comparison with those mentioned by Boulenger in the Mon. Lacertidæ, ii. 1921, p. 96, are :—

*A. c. arabicus.*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
|---|---|---|---|---|---|---|---|---|---|
| Bil Ashush, ♂ .... | 59 | 35 | 16 | 30 | 10 | 34 | 19/20 | 24 | 5 |
| Hailat al Shisur, ♂. | 63 | 35 | 16 | 28 | ? | 30 | 18 | 23 | 5 |

*A. c. blanfordi.*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Jaub al Izba, ♂ .... | 78 | 48 | 14 | 32 | 12 | 35 | 21 | 25 | 5 |

1. Length from snout to vent. 2. Dorsal and lateral scales across the middle of the body. 3. Longitudinal series of ventrals. 4. Transverse series of ventrals. 5. Plates in collar. 6. Gular scales from chin-shields to collar. 7. Femoral pores. 8. Lamellæ beneath the fourth toe. 9. Labials in front of the centre of the eye.

### (9) *Acanthodactylus scutellatus* (Audouin).

♂, Bahat Jamal (550 ft.).

This lizard appears to be referable to *A. scutellatus* (sensu lato), but differs from the typical form in having longer limbs, longer digits, and fewer dorsal scales across the body. In Africa the typical form gives place on the south and west of its ranges to a distinct race (*A. s. audouini*, Boulenger), characterized by these differences, and it appears probable that in Arabia a similar condition exists. The typical form has been recorded from southern Iraq (Basra), but whether the form occurring in the Rub'al Khali should be referred to *A. s. audouini* or to a different subspecies it is impossible to say on the basis of a single example. Details of the specimen, for comparison, are :—

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
|---|---|---|---|---|---|---|---|---|---|
| ♂ .... | 53 | 58 | 12 | 31 | 9 | 37 | 23/24 | 27 | 4. |

### (10) *Eremias brevirostris* (Blanf.).

♂, Jaub Sufaiya (200 ft.).

### (11) *Eremias adramitana*, Boulenger.

♂, Qatar hinterland.

This record considerably extends the range of the species, which has hitherto been known only from the Hadramaut.

## Scincidæ.

### (12) *Scincus mitranus*, Anderson.

2 ads., 1 hgr., Kharaiyidi Fasad, Ramlat Shuait, and Shéna.

### REPTILIA, OPHIDIA.

### Boidæ.

(13) *Eryx jayakari*, Boulenger.

♀, Jahashi (400 ft.). Sc. 47 ; V. 184 ; C. 21 + 1.

### Colubridæ.

(14) *Malpolon moilensis* (Reuss).

♂, Wadi Hauf.

### Viperidæ.

(15) *Cerastes cornutus* (Linn.).

♂, Ramlat Shuait. Sc. 30 ; V. 162 ; C. 35 + 1.

## LXXII.—*Six nouveaux Coléoptères* (Curculionidæ, *Zygopini*) *de l'Amérique méridionale.* Par A. HUSTACHE.

*Zygops batesi*, sp. n.

Oblong, les pattes longues, les fémurs postérieurs dépassant l'apex des élytres de la moitié de leur longueur. Brun rouge, le prothorax orné de deux bandes squamuleuses d'un flave blanchâtre, obliques, commençant sur les angles postérieurs, les élytres avec une fascie arquée blanchâtre, vers le quart postérieur, précédée d'une fascie dénudée, le reste du revêtement flave, assez dense et composé de très petites squamules sur les élytres, de courts poils squamuleux et très épars sur le prothorax. Dessous à revêtement dense, d'un flave pâle, presque unicolor, sans taches foncées. Pattes à revêtement flave, fin, peu serré, sans taches.

Rostre roux, à la base densément squamulé et tricaréné. Yeux à la base contigus, du milieu au sommet divergents et entourés d'une bande jaune squamuleuse, nette, la tête lisse, glabre, luisante. Antennes rousses postmédianes, le 2$^e$ article du funicule très long, plus long que les 5 articles suivants ensemble, le 3$^e$ assez allongé, les 6$^e$ et 7$^e$ courts, ovales-globuleux.

Prothorax transversal, subtrapézoidal, se retrécissant en avant, les côtés obliquement convergents, légèrement sinués en dedans vers le milieu. la base fortement bisinuée, le sillon transversal antérieur profond ; modérément convexe, latéralement déprimé le long des bandes claires, le milieu du disque avec quelques fines rugosités transversales. Ecusson arrondi, convexe, éparsément squamulé.

Elytres très peu plus larges que le prothorax, un tiers plus longs que larges, faiblement rétrécis en arrière, largement arrondis ensemble au sommet, le calus huméral grand mais peu élevé;

disque profondément impressionné dans sa moitié antérieure entre les 5e interstries, en arrière et les côtés convexes; chaque élytre pourvu de 10 séries de points arrondis, assez gros, en avant séparés, en arrière plus petits et réunis par de fines stries; 3e interstrie modérément relevé et épaissi à sa base, granulé ainsi que la suture en arrière. Pygidium grand, semi-elliptique, vertical, finement ponctué et éparsément squamulé.

Pattes longues, grêles, les fémurs armés d'une assez forte dent, les postérieurs bidentés.

Long. 7–7·5 mm.

Brésil: Ega (*Bates*, British Museum); trois spécimens.

### *Zygops albiventris*, sp. n. (*Z. albiventris*, Buq., *in litt.*).

Cylindrique, noir, le revêtement varié, rouge-cinnabre, jaune et blanc. Yeux séparés largement par une bande jaune s'élargissant au sommet, atteignant leur bord supérieur, séparée de la bande externe par une petite tache veloutée, d'un brun-noir, cette bande latérale s'élargissant inférieurement. Vertex noir, son triangle médian mat et glabre. Rostre aussi long que le prothorax, noir, à sa base élargi, caréné et jaune au milieu, avec un court trait latéral jaune. Antennes postmédianes, d'un rouge ferrugineux, le 2e article du funicule plus long que les cinq suivants ensemble, le 3e presque aussi long que les 3 suivants réunis, les trois derniers globuleux.

Prothorax subcylindrique, transversal, légèrement rétréci en avant; sa moitié antérieure rouge, interrompue par deux bandes longitudinales noires, bordée en arrière par une bande jaune, laquelle remonte un peu en dedans, et en arrière atteint la base; base avec un liséré jaune, s'élargissant dans les angles postérieurs en forme de tache (se prolongeant en dessous), séparée de la bande médiane jaune par une bande oblique, noire (passant en dessous); flancs, en arrière avec un sillon arqué contournant le bord postérieur et invisible de dessus; bande médiane rouge en avant, jaune en arrière. Ecusson grand, transversal, avec quelques squamules jaunes sur les côtés et la ligne médiane.

Elytres cylindriques, peu plus larges que le prothorax, presque de moitié plus longs que larges; stries fines, géminées, leurs points peu serrés. Interstries en arrière très plans bruns et saupoudrés de squamules blanches; en avant les interstries pairs plans et assez densément couverts de squamules jaunes formant des bandes graduellement effacées, la suture et les interstries impairs légèrement convexes, d'un brun-noir, le calus huméral noir. Pygidium semi-ovale, saupoudré de squamules blanches.

Pattes robustes; fémurs et tibias en dedans, les postérieurs entièrement (sauf la base noire), revêtus d'une dense pubescence squamuleuse d'un cendré argenté; fémurs postérieurs atteignant juste l'apex, bidentés, finement carénés extérieurement, les autres fémurs unidentés. Dessous d'un cendré argenté sur les 4 derniers segments ventraux et la moitié du 1er; épisternes métathoraciques avec une tache blanche sur son angle postérieur, une autre jaune teintée de rouge sur l'angle antérieur ; une petite tache sur la base des épimères. Métasternum avec des squamules blanches éparses, un peu plus serrées dans le milieu.

Long. 5–6·5 mm.

Brésil : Rio de Janeiro, Bahia (*Fry*, British Museum) ; cinq spécimens.

Espèce très particulière caractérisée par sa forme et son dessin.

### *Copturus leucoventris*, sp. n.

Ovale, brun, le revêtement dorsal fin, formé de squamules linéaires sur le prothorax, d'un flave jaunâtre, plus grossières, assez serrées, transversalement dirigées vers le milieu, plus claires, blanchâtres sur la ligne médiane, sur les élytres flaves et bisériées sur la base des interstries, devenant plus petites, très fines et d'un brun foncé en arrière, la suture et l'écusson recouverts par une bande blanche squamuleuse. Dessous, pattes, pourtour des yeux et leur ligne interoculaire, base du rostre, interstrie marginal des élytres, uniformément et densément revêtus de squamules blanches.

Rostre ferrugineux, arqué, plus long que le prothorax, luisant, à ponctuation fine, espacée, un peu plus forte et plus serrée vers la base, cette dernière avec une fine carène médiane. Antennes d'un rouge ferrugineux, postmédianes, le 2<sup>e</sup> article du funicule aussi long que les 3<sup>e</sup> et 4<sup>e</sup> ensemble, le 5<sup>e</sup> oblong et peu plus long que large, les 6<sup>e</sup> et 7<sup>e</sup> plus courts, globuleux. Yeux très grands, séparés par une étroite ligne squamulée, dédoublée dans le tiers supérieur mais peu élargie.

Prothorax à sa base presque du double aussi large que long au milieu, se rétrécissant très peu en avant, à peine resserré vers les angles antérieurs, les côtés subparallèles ; peu convexe, à ponctuation peu serrée, chaque point donnant naissance à une squamule.

Elytres déprimés, en demi-ovale, peu plus longs que larges, le calus huméral gros, squamulé, le calus antéapical effacé ; stries assez fortes, leurs points caténulés et pourvus d'un poil court ; interstries du double aussi larges que les stries, légèrement convexes, bisérialement pointillés.

Pattes d'un rouge ferrugineux. Fémurs presque aussi larges vers la base qu'au milieu, non carénés extérieurement, les postérieurs bidentés, les autres paraissant unidentés, la 2<sup>e</sup> dent réduite à une dilatation plus ou moins obsolète ; fémurs postérieurs dépassant un peu l'apex, leur genou sans dent. Tibias normaux, légèrement arqués à la base.

Mésosternum impressionné, le bord antérieur du métasternum incliné et légèrement impressionné. Suture interne des épisternes métathoraciques avec une ligne de granules jaunes.

Long. 4 mm.

Brésil (*Bates*, *Bowring*, British Museum) ; trois spécimens. Cette espèce appartient au 5<sup>e</sup> groupe d'Heller.

### *Copturus semirufus*, sp. n.

Ovale, d'un brun rouge, la pubescence dorsale flave, composée de squamules linéaires, appliquées, peu serrées, formant un dessin, comprenant: sur le prothorax trois larges bandes longitudinales, les deux dorsales fortement élargies en avant, se réunissant presque à la médiane et latéralement prolongées en dessous; sur les élytres une fascie couvrant presque le tiers basal (interrompue par le calus huméral), une ligne suturale (squamules plus serrées), largement interrompue vers son tiers postérieur, flanquée, immédiatement avant l'interruption, d'une linéole sur les 2ᵉ et 3ᵉ interstries, les 7ᵉ et 8ᵉ interstries pourvus vers leur tiers postérieur d'une semblable linéole, une fascie apicale, étroite, remontant sur le dernier interstrie jusqu'à sa base, sur l'avant dernier jusque vers le quart antérieur. Dessous revêtu de fines squamules serrées, blanchâtres sur le milieu, devenant flaves sur les côtés et sur les pattes, très blanches sur la base du rostre et des yeux.

Rostre roux, arqué, plus long que le prothorax, à sa base dilaté, fortement comprimé latéralement et avec une vive carène médiane, en avant lisse et luisant. Antennes rousses, postmédianes, le 2ᵉ article du funicule aussi long que les 4 suivants réunis, les 3ᵉ et 4ᵉ oblongs et seulement de moitié plus longs que larges. Yeux séparés par une ligne squamuleuse très étroite, dans sa moitié supérieure dédoublée, assez fortement élargie et creusée.

Prothorax presque du double aussi large à la base que long au milieu, peu rétréci en avant, la base fortement bisinuée, son lobe médian largement arrondi; peu convexe, mat, la ponctuation fine, peu profonde et peu serrée, avec des traces d'une ligne médiane lisse, ses flancs avec une tache dénudée, allongée, en partie visible de haut sur les côtés. Ecusson pubescent.

Elytres semi-elliptiques, déprimés, un tiers plus longs que larges, largement arrondis au sommet; séries assez étroites, profondes, leurs points piligères, interstries de 3 à 4 fois aussi larges que les stries, densément pointillés, faiblement convexes, revêtus (en dehors des parties flaves) d'une très courte pubescence d'un rouge brun.

Pattes courtes et robustes, ferrugineuses. Fémurs carénés extérieurement (antérieurs exceptés), assez fortement unidentés, les postérieurs n'atteignant pas tout à fait l'apex. Tibias normaux, assez épais.

Mésosternum fortement, saillie métasternale faiblement impressionnés. Suture interne des épisternes métathoraciques avec une ligne de granules jaunes.

Long. 4 mm.

BRÉSIL (*Bates*, British Museum); trois spécimens.

Cette espèce peut être rattachée au groupe iii. ou au groupe v. d'Heller suivant l'importance attachée aux caractères de ces groupes; elle est en réalité intermédiaire entre les deux.

### *Macrolechriops crassipes*, sp. n.

Ovale, noir; revêtu sur le prothorax de squamules jaunâtres, tapissant les points, assez serrées, celles des côtés lancéolées, celles du milieu plus étroites, blanches sur le lobe antéscutellaire. Elytres revêtus de squamules linéaires, sétiformes, légèrement soulevées, jaunâtres et cendrées, ces dernières formant un dessin peu tranché et comprenant une bande sur la moitié antérieure de la suture et du 2e interstrie, flanquée d'une linéole à son extrémité sur les interstries 3, 4, 5, une étroite bordure apicale remontant un peu sur la suture, un point cendré postmédian sur le 7e interstrie; en outre, vers le tiers antérieur des 3e et 5e interstries une tache très petite sur le 5e, plus grosse sur le 3e d'un brun noir velouté (parfois aussi ces taches réunies sur le 4e), formées d'une touffe de grosses squamules.

Rostre d'un brun ferrugineux, lisse, à la base dilaté avec une courte ligne médiane lisse et assez densément squamulé de jaune. Ligne interoculaire squamulée, jaune, très étroite, dans sa partie supérieure fortement élargie et creusée, puis bordant étroitement les yeux. Tête mate, à pointillé très fin, épars, sans plaque spéciale. Antennes ferrugineuses, insérés vers le quart basal du rostre, le 2e article du funicule à peine moins épais et à peine plus long que le 1er, aussi long que les 3e et 4e ensemble, ces deux derniers environ du double aussi longs qu'épais, les trois derniers transversaux.

Prothorax à la base du double aussi large que long au milieu, assez fortement rétréci en avant et les côtés très peu arqués; convexe, relevé dans le milieu, la gibbosité centrale surmontée d'une courte mais vive carène, en avant légèrement impressionné transversalement entre une ligne d'assez gros points et le sommet. Ecusson convexe, arrondi, squamulé, entouré d'un sillon.

Elytres en demi-ovale, à peine plus longs que larges, la base fortement bisinuée (comme celle du prothorax), les épimères visibles de haut, en arrière largement arrondis, le calus huméral gros et lisse; légèrement déprimés en avant le long de la suture; sillons assez profonds, ponctués au fond; interstries dorsaux de 2 à 3 fois aussi larges que les sillons, plans, rugueux, les 3e et 5e sensiblement élargis au niveau de la tache foncée.

Pattes courtes, robustes, assez densément couvertes de squamules linéaires, jaunes, sans taches. Fémurs remarquablement larges et comprimés, profondément canaliculés et inermes en dessous, à la base plus larges qu'au milieu. Hanches intermédiaires terminées par un court tubercule, les antérieures par un plus long tubercule lamelliforme, les fémurs postérieurs atteignant à peine le 3e segment ventral. Tibias ferrugineux, courts, comprimés, leur onglet apical robuste. Tarses roux, les ongles petits et simples.

Bord antérieur du métasternum creusé en voûte pour la réception du sommet du rostre, le mésosternum impressionné. Dessous uniformément couvert de squamules jaunes. Suture interne des épisternes métathoraciques avec une ligne de granules jaunes.

Long. 3·1–3·3 mm.

BRÉSIL: Ilha Santo Amaro, Santos (*G. E. Bryant*, iii.–iv. 1912, British Museum); cinq specimens.

### *Lechriops fallaciosus*, sp. n.

Ovale, noir, les antennes et les tarses roux. Prothorax subglabre, mais avec des traces de trois bandes dorsales et de deux marginales, ocrées ou jaunes, la médiane réduite à quelques squamules plus nombreuses aux extrémités, les dorsales étroites, interrompues ordinairement dans le milieu et alors réduites à deux taches, leurs squamules peu nombreuses et peu serrées, les marginales ocrées, assez larges, denses, mais étroitement visibles de haut. Elytres à pubescence foncière très courte et noire, parsemée de petites squamules linéaires jaunâtres, ça et là un peu plus serrées, ornés en outre de quatre points blancs, dont deux sur la suture, le plus gros vers le milieu, l'autre au sommet, les deux autres un peu en arrière du milieu du 8^e^ interstrie.

Rostre aussi long que le prothorax, brun-ferrugineux au sommet, en avant luisant, très éparsément et très finement pointillé, en arrière élargi, rugueusement ponctué, avec une carène médiane vive et des squamules cendrées peu serrées. Antennes postmédianes, le 2^e^ article du funicule plus long que le 1^er^. Ligne interoculaire très étroite, squamulée, dans sa partie supérieure peu élargie mais creusée. Tête noire, mate, avec une ligne médiane alutacée, avec quelques squamules claires seulement sur les côtés contre les yeux.

Prothorax, à la base amplement du double aussi large que long au milieu, en avant un cinquième moins large qu'à la base, cette dernière fortement bisinuée, les côtés très peu arqués, derrière le bord antérieur à peine resserrés; peu convexe, la ponctuation assez forte et profonde, les points sur le disque serrés mais séparés, sur les flancs formant quelques fines rides, vers le bord antérieur plus petits, la carène médiane lisse assez forte, effacée à ses extrémités. Ecusson noir, glabre, éparsément ponctué.

Elytres en demi-ovale, à peine plus longs que larges, largement arondis au sommet, le calus huméral gros, rugueux, glabre à son sommet; modérément convexes et légèrement déprimés le long de la suture en avant; sillons profonds, luisants au fond, leurs points serrés et en partie pubescents; interstries dorsaux trois fois environ aussi larges que les sillons, plans, fortement rugueux.

Fémurs et tibias à pubescence foncière noire, parsemée de poils blancs; fémurs rugueux, carénés extérieurement, finement dentés en dessous, les genoux postérieurs avec leur angle apical inférieur aigu.

Dessous à squamules blanches peu serrées. Hanches antérieures terminées par un tubercule conique. Suture interne des épisternes métathoraciques avec une ligne de granules jaunes.

Long. 3·5 mm. environ.

Brésil: Nova Friburgo, Rio de Janeiro (*ex Donckier*, ma coll.), types; Santos, Ilha Santa Amaro (*G. Bryant*, British Museum).

Cette espèce appartient au groupe assez nombreux d'espèces noires avec quelques points blancs.

## LXXIII.—*De novo Pogoninorum genere* (*Coleoptera*, Carabidæ). By V. Lutshnik.

### DIODERCARUS, gen. nov.

Corpus alatum, valde angustum, subparallelum. Mandibulæ elongatæ, prominentes. Caput fronte utrinque plica suborbitalia nulla. Mentum dente fisso lobis lateralibus subtrigonalibus multo breviore. Prothorax haud cordatus, ante brevissime subsinuatis, utrinque indistincte foveolatis, carinula marginalis nulla. Trochanteres posticis acuminati, in maris valde spinoso-producti. Cetera ut in genere *Cardioderus*, Fisch.-W.

Typus generis: *Diodercarus arrowi* m.

### *Diodercarus arrowi*, sp. n.

Rufo-testaceus, pallidus, sine nitore metallico, mandibulis obscurioribus, oculi nigri. Capite sat lato, lævi, clypeo apice recte truncato, impressionibus frontalibus latis, obsoletis, vix ullis. Oculis magnis, paulo prominulis. Prothorace subquadrato, longitudine sua paulo latiore, capite cum oculis sensim latiore, basi magis quam apice angustato, apice fere recto, angulis anticis haud prominulis, rotundatis, lateribus antice parum rotundato, latitudine maxima longe ante medium, ante angulos basales brevissime subsinuato, his paulo prominulis, subrectis, disco convexo, lævi, nitido, basi profunde impresso, impressionibus basalibus indistinctibus. Elytris prothorace paulo latioribus, oblongo-ovalibus, lateribus parum rotundatis, subparallelis, tenuiter, haud profunde striatis, striis subtilius punctatis, interstitiis planis, 3° tripunctato, 5° ante apicem puncto unico instructo, carinula basali sinuata, ad humerum angulata denticuloque prominulo terminata. Corpore subtus lævigato.

Long. 6–8 mm.

Irak: Fao, v. 1891. D. & W. Cumming. 6 specimina (♂ ♂ ♀ ♀) in Mus. Britann.

Meritissimo entomologo anglico, Dom. G. Arrow, hanc speciem dedicavi.

## LXXIV.—*A new Species of Indian Humble-bee in the Collection of the British Museum* (*Hymenoptera*, Bombidæ). By O. W. Richards, M.A.

Some of the most brightly coloured Indian humble-bees (*Bombus*) are the species of the subgenus *Orientalibombus*, Richards (*B. orientalis*, Sm., *B. hæmorrhoidalis*, Sm., etc.). Each of these species, with its distinctive pattern, is closely resembled by several other humble-bees, belonging to other subgenera. This has already been partly recognized by Friese (1918), who noted the resemblance to *B. orientalis*, Sm., and *B. hæmorrhoidalis*, Sm., of *B. dentatus*, Handl., and *B. orichalceus*, Friese (subgenus *Alpigenobombus*, Skor.), respectively. It is the object of the present paper to show that there is a hitherto unrecognized species of *Bombus* (subgenus *Hortobombus*, Vogt) which occurs in a number of colour-patterns resembling ~~each of the~~ main colour-forms of the same pair of species.

### *Bombus mimeticus*, sp. n.

*Female.*—The hairs are black; those of tergites 1–2 creamy white; of 5 and of the apex of 4 dark orange-red; venter with reddish hairs on sternites 4–5; legs distinctly pitchy with black hairs; wings black-brown; hairs short and even; length 20 mm., breadth at the tegulæ 6·5 mm.

Mandibles with a not very clear sulcus obliquus; incisura faint; basal keel and furrow strong. Labrum with two medium-sized, rather flat, strongly punctured tubercles; labral furrow rather deep, about as broad as a tubercle; lamella little developed, two-thirds as wide as the labrum. Clypeus elongate, strongly convex, punctured all over, quite closely on the basal half, the punctures of various sizes, many large; apical impressions not very deep or well-defined, rather closely punctured. Malar space elongate, once and two-thirds as long as broad, nearly as long as the third, fourth, and fifth antennal segments taken together, bearing a number of fine punctures. Antennæ with the third segment about twice as long as broad, a little shorter than the fourth and fifth segments together; fourth segment quadrate, fifth once and a half as long as the fourth, sixth to twelfth as long as the fifth. Ocelli and eyes normal, a large, smooth, unpunctured space round the former. Mid-basitarsus very little clothed with hairs, strongly spinosely produced; hind basitarsus somewhat, hind tibiæ a little produced at the apical angle, the former nearly bare, the latter strongly shining, not alutaceous. Last tergite dull, punctured, its apex not much upturned. Last sternite with a short keel.

Type, 1 ♀, Tukvar, Darjeeling, 4000 ft., April 1894 (*C. T. Bingham*).

Differs from *B. orientalis*, Sm., which it exactly resembles in colour, in the puncturation of the clypeus, the colour of the legs, the spinose production of the mid-basitarsus which lacks hairs, and in the duller last abdominal tergite. Structurally *B. mimeticus* is more closely allied to *B. montevagus*, Sm., and *B. trifasciatus*, Sm. From the former it differs in having the malar space a little shorter and the labral tubercles less convex and less sharply angulated; from the latter in having the malar space a little longer, the clypeus more strongly punctured on the basal half and the labral furrow wider and deeper. Judging from the structure of the male (described later under variety *magrettianus*) the closest relationship is with *B. diversus*, Sm. In the female of the latter species, however, the malar space is only once and a third as long as broad, the clypeus has a large unpunctured disc, its apical impressions are deeper and better defined, while the last tergite is more shining with sparser and larger punctures. The male genitalia (figs. 1 & 2) agree in most respects with those of *B. diversus*, but [illegible] has two inwardly directed spinose processes in [illegible] one.

### Var. *albolateralis*, nov.

Resembles the type, but a large patch of hairs on the mesopleuron is white. 1 ☿ (length 16 mm., breadth 4·5 mm.), in bad condition, from Nepal.

Parallel to *B. orientalis*, Sm., var. *pectoralis*, Friese.

### Var. *gantokiensis*, nov.

Resemble the type, but the pale hairs of tergites 1–2 are pale yellow. 1 ♀ (length 21 mm., breadth 7 mm.), Gantok, Sikkim, 24–26 June, 1903, Tibet Expedition.

Parallel to *B. orientalis*, Sm., var. *buccinatoris*, Sm.

### Var. *turneri*, nov.

Resembles the variety *gantokiensis*, but a large patch of hairs on the mesopleuron is white. 1 ♀ (length 20 mm., breadth 6·5 mm.), Assam, *R. E. Turner*; 1 ☿, "India," Wilson Saunders coll., Hope Department, Oxford University Museum (kindly lent me by Prof. E. B. Poulton). A ♀ in the British Museum Collection, from the Khasi Hills, is intermediate between the varieties *turneri* and *gantokiensis*, in that the hairs at the base of the abdomen are very pale yellow.

Parallel to *B. orientalis*, Sm., var. *khasianus*, Richards.

### Var. *insidiosus*, nov.

Resembles the type, but the hairs of tergites 1–2 are bright yellow, and of tergites 3–5 bright reddish orange. The hairs are perhaps a trifle shorter.

Type, ♀ (length 19 mm., breadth 6 mm.), Baltistan; paratypes, 1 ♀, Shanghai; 1 ☿, N. India; 1 ☿ with no locality in the Wilson Saunders coll.; 1 ☿, Simla, 6000–7000 ft., Aug. to Sept. 1925, in jungle (*B. Chopra*; coll. T. H. Frison). Dr. Frison has a considerable series of this variety in his collection; he has been kind enough to supply me with the following data:—1 ☿, Murree, Punjab, sta. 6, ca. 7242 ft., 4 Sept., 1928 (*H. S. Pruthi*); 2 ☿ ☿, Pindi Point, Murree, Punjab, sta. 33, ca. 7212 ft., 23–24 Sept., 1928 (*H. S. Pruthi*); 1 ☿, wild grass near Kuldana, Murree subdivn., Punjab, 7006 ft., sta. 19, 13 Sept., 1928 (*H. S. Pruthi*); 4 ☿ ☿, Kandaghat, Simla Hills, 3500–4600 ft., sta. 2, Aug. 1925 (*B. Chopra*); 5 ☿ ☿, Simla, 6000–7000 ft., sta. 1 (jungle), Aug.–Sept. 1925 (*B. Chopra*); 1 ☿, Ghuma, Simla Hills, 3700 ft., 6–8 Sept., 1925, in jungle (*B. Chopra*). Dr. Frison has also examined a worker (Ind. orient., Himalaya, coll. Hügel, in the Vienna Museum) wrongly determined by Handlirsch (1888, p. 226) as *B. hæmorrhoidalis*, Sm. The other specimens in Handlirsch's series were correctly determined.

Parallel to *B hæmorrhoidalis*, Sm.

### Var. *geminatus*, nov.

Resembles the variety *insidiosus*, but a large patch of hairs on the mesopleuron is white and the hairs of tergite 1–2 are more sulphur, less ochreous. 1 ☿ (length 13 mm., breadth 4 mm.), Gulmarg, Kashmir, summer 1913 (*Lt.-Col. F. W. Thomson*); paratype, 1 ☿, N. India (Wilson Saunders coll.).

Parallel to *B. hæmorrhoidalis*, Sm., var. *albopleuralis*, Friese.

### Var. *magrettianus*, nov.

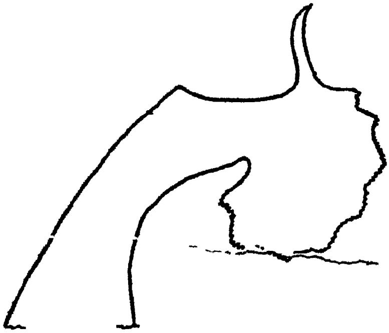
*Bombus magrettii*, Friese (1918, p. 81), *nec* Gribodo.

*Worker.*—Apex of the malar space, the whole clypeus, the mandibles, and tergites 4–6 reddish testaceous; legs piceous, tibiæ and tarsi more reddish. Hairs black; those of mesopleuron and thoracic sternites white; of tergite 1 and a narrow base to tergite 2 pale yellow; of tergites 4–6 orange-red; of venter orange-red; of legs yellow, those of hind femora dorsally black; hind tibiæ with a few black hairs at base; wings a dark brown; hairs short and even. Length 14·5 mm., breath at the tegulæ 5·5 mm.

*Male.*—Resembles the worker, but the femora are darker; short hairs of the head pale; femora with more black hairs; hairs at base of venter more white. Length 15 mm., breadth at the tegulæ 4·5 mm.

In the genitalia, the sagittæ are emarginate beneath near their base, leaving a median ventral tooth, and their apex is expanded and laterally serrate, the basal tooth of the serrations being larger than the others. The volsella (fig. 1) is narrow before the apex, where it emits internally an irregularly serrate, subcircular process which bears a sharp tooth posteriorly; the serrations of this process are themselves microscopically serrate. The stipes are broadly truncate at their apex. The squama is much broader than long and on its inner margin, where it meets the stipes, it emits two curved hook-like processes; beyond this the inner margin is moderately straight and somewhat thickened (fig. 2). The only species (of those I have been able to examine) which has at all similar genitalia is *B. diversus*, Smith. In this species the sagittæ are of similar form, being considerably broadened in the dorso-ventral direction, emarginate beneath leaving a tooth near their base, the apex

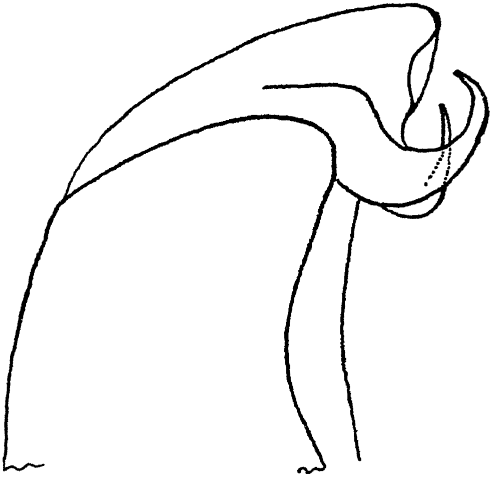
Fig. 1.



Dorsal view of the apex of the volsella of *B. mimeticus*, var. *magrettianus* (type).

gradually but eventually quite strongly expanded, the expansion laterally serrate (about four small teeth). The volsella is of the same general form, but its apex is produced beyond the point where it emits the subcircular process, forming a sharp point; the subcircular process is smaller with finer serrations, and the tooth on the process is longer and directed more inwards. The squama is much broader than long, basally produced into a long, narrow, parallel-sided, curved process, whose apex is narrowly truncate or bluntly pointed; the inner margin of the squama is basally curved in continuity with the process; the apical half is truncate inwardly in straight line.

Fig. 2.



Dorsal view of the apex of the right stipes and squama of the same specimen.

*Type*, ♂, Sikkim (*Bingham*). Paratype, ☿, Taungu, Tenasserim, 4000 ft., May 1898. These specimens are in the collection of the Berlin University Museum, and were kindly lent me by Herr Dr. Bischoff. They form part of the material which Friese recorded as *B. mayrettii*.

## REFERENCE.

FRIESE, H. 1918. "Ueber Hummelformen aus dem Himalaja." Deutsche ent. Zts. 1918, pp. 81–6.

## LXXV.—*Description of Three Palæarctic Butterflies.* By Captain A. F. Hemming, C.B.E.

### Hesperidæ.

### *Hesperia armoricanus*, Oberth.

*Syrichthus alveus*, form *armoricanus*, Oberth., 1910, Et. Lépid. Comp. iv. p. 411, pl. lvii. figs. 509–517, "Environs de Rennes."

In a small but interesting collection of butterflies kindly made for me in various parts of the Lebanon in July 1927 by Captain L. K. Lockhart, M.B.E., M.C., R.A., Transjordan Frontier Force, and Major Smith, Transjordan Frontier Force, there is a long series of an undescribed subspecies, which I describe as follows:—

### *Hesperia armoricanus* **philonides**, subsp. n.

♂.—*Upperside. Fore wing*: markings similar to those in *a. armoricanus*, except that the white spots are squarer and relatively larger, and the discal spot larger and more clearly defined; the basal area heavily powdered with whitish scales. *Hind wing*: median band large and well developed; marginal row of spots complete and well developed.

♂.—*Underside. Fore wing*: ground-colour greyish, the basal area practically white as in *H. foulquieri bellieri*, Obth.; the veins outlined with white scales. *Hind wing*: ground-colour pale yellowish (much paler than in *a. armoricanus*); median band complete and much heavier and more regular, spots in interspaces 2 and 3 (which are small in *a. armoricanus*) being well developed.

*Average length of fore wing*: 12 mm. (13 mm. in *a. armoricanus*).

*Hab.* Lebanon: Anger, 16 & 20. vii, 18 ♂♂; Shtora, 17, 20, & 23. vii., 8 ♂♂; Khan Ghaffa, 21. vii., 2 ♂♂; El Hame, 18. vii., 2 ♂♂.

♂ *holotype.* Khan Ghaffa, 21. vii. 1927 (A. F. Hemming coll. no. 21187).

Paratypes in Hemming coll. and in British Museum (B.M. types no. Rh. ♂ 366–7).

The 30 ♂♂ taken show that the subspecies bears to subsp. *armoricanus* the same relation that *H. foulquieri bellieri*, Obth., does to nominotypical *foulquieri*.

On the whole, *philonides* is less closely allied to nominotypical *armoricanus* than to subsp. *lecerfi*, Verity (1928). The latter name is a nom. nov. for *H. armoricanus*, var. *reverdini*, Le Cerf (1913), which is invalid, because it is a secondary homonym of *Syrichthus reverdini*, Obth. (1912). Subspecies *lecerfi* is found in Persia (types from Bazouft and Lagherit). Subspecies *philonides* is, however, readily separable from it by the brownish ground-colour on the upperside; and on the hind wing on the upperside by (*a*) the absence of white basal spots, by (*b*) the median row of white spots being incomplete and less sharply defined by the background, and by (*c*) the smaller size of the white spots in the marginal row, especially in interspaces 1 and 2.

The species was apparently only just emerging at the time of Captain Lockhart's visit to the Lebanon, with the result that unfortunately no females were taken. The genitalia have been examined and differ in no way from nominotypical *armoricanus*.

## **Lycænidæ.**

### *Plebeius eversmanni*, Staudinger.

*Lycæna eversmanni*, Staudinger, 1886, Ent. Z. Stett. xlvii. p. 205, "Gebirge bei Margelan, 1500–2000 m."

The subspecies found in Samarkand differs materially from nominotypical *eversmanni*, and I name it

### *Plebeius eversmanni* **titania**, subsp. n.

Differs from nominotypical *eversmanni* as follows:—

♂.—*Upperside.* Much more heavily and uniformly scaled with blue, the blue scales being without the purplish tinge seen in that subspecies. *Fore wing*: marginal border blackish and about 2 mm. wide. *Hind wing*: submarginal lunules well developed; discoidal spot hind wing vestigial (well marked in *e. eversmanni*).

♀.—*Upperside.* Uniform dark brown without blue scaling at base of wings or above black submarginal spots to hind wing (both present in *e. eversmanni*).

♂ ♀.—*Underside.* Generally similar to *e. eversmanni*, but submedian spots (especially on hind wings) relatively larger; ground-colour in ♂ browner and less greyish, in ♀ whitish.

*Length of fore wing*: 17–18 mm. (15–16 mm. in *e. eversmanni*).

*Hab.* SAMARKAND: Sary-Ob, Sarafschan, 7000–9000 ft. (*Funke*); Transalai; Kitschi-Karemi (*Gr.-Gr.*).

♂ *holotype* (B.M. type no. Rh. 361) and ♀ allotype (B.M. type no. Rh. 362) both labelled "Samarkand *ex Staudinger*" and ♂ 2, ♀ 1, paratypes also from Samarkand (B.M. types no. Rh. 363–4 ♂, 365 ♀).

### *Polyommatus eurypilus*, Frr.

*Lycæna eurypilus*, Frr., 1851, Neuere Beitr. Schmett. vi. (96) p. 148, pl. 573. fig. 4, ♂, "Amasia."

The British Museum Collection contains the following striking undescribed subspecies, which I name

### *Polyommatus eurypilus* **euæmon**, subsp. n.

♂.—*Upperside. Fore wing*: differs from nominotypical *eurypilus* by the presence of (usually four to five) well-developed orange inter-neural marginal lunules (absent in *e. eurypilus*). *Hind wing*: complete series of orange marginal lunules (not more than two such lunules and often none in *e. eurypilus*) surmounting large black marginal spots, which are very distinct owing to presence of whitish scales (absent in *e. eurypilus*) between them and the margin.

♀.—*Upperside. Fore wing*: differs from *e. eurypilus* by presence of complete band consisting of six large orange inter-neural lunules. *Hind wing*: complete series of inter-neural lunules, which are larger and brighter orange. (In *e. eurypilus* only four or five such lunules.) Black marginal spots as in male.

♂ ♀.—*Underside.* Ground-colour much whiter than in *e. eurypilus* and orange band (all four wings) much wider, black submarginal spots larger.

*Length of fore wing*: 16 mm. (14 mm. in *e. eurypilus*).

*Hab.* LEBANON: Mt. Hermon, Baalbek; Syria, Aleppo district.

♂ *holotype*, ♀ *allotype* labelled "Mt. Hermon, 5000 ft. May 1900, *Nicholl*" (B.M. types no. Rh. 373 ♂, 374 ♀).

*Paratype.*—"Syria, Baalbek, *Nicholl*, ♀ 1" (B.M. type no. Rh. 375).

The British Museum also possesses this subspecies from the Aleppo district (♀ 3, 4. vii. 1919, *F. G. Aldous*) and from Afra in the Lebanon, 6. 1900. Mr. R. D. Ellison, His Majesty's Vice-Consul, Beyrout, took it on Mt. Kanisah in the Lebanon in June 1928.

## LXXVI.—*Descriptions and Records of Bees.*—CXXX.

By T. D. A. Cockerell, University of Colorado.

The holotypes of the Yucatan bees described below are in the Museum of Comparative Zoology, Harvard University.

### *Megachile frugalis atrescens*, subsp. n.

♂ (type).—Like *M. frugalis*, Cresson, of the United States, but anterior wings blackish, subviolaceous, with the marginal cell, second cubital, and apical area beyond them fuliginous. Length about 11 mm.

Face and front with long pure white hair, but long outstanding black hair on basal part of clypeus; anterior tarsi, except last joint, fringed with pure white hair behind; middle tarsi with short pale fulvous hair; hind tarsi with pure white hair in front and red hair on inner side; end of abdomen with the characteristic *M. frugalis* structure, broadly emarginate, sharply bidentate, obtusely lobed sublaterally, and with a sharp tooth at each side of base of sixth tergite.

♀.—Length 11·3 mm.

Similar to *M. frugalis*, but differing thus:—Clypeus and supraclypeal area with much white hair, though there is some black at base of clypeus; wings not at all reddish, stigma darker, marginal cell dilute blackish, and a strong dark cloud beyond it; tegulæ black; ventral scopa black on last two sternites, otherwise clear white; the abruptly descending sixth tergite has much black hair and no pale pile.

Yucatan: Chichenitza (*Bequaert*).

### *Megachile addubitans*, sp. n.

♀.—Length about 10·4 mm.

Black, with the pale hair white, the abdominal bands (narrow and entire) faintly creamy, the ventral scopa white, with a faint reddish tinge subapically, and black at tip of last sternite. A parallel-sided species, with the general build and appearance of *M. frugalis*, but easily separated as follows:—Clypeus even shorter than in *M. frugalis*, and coarsely rugose, though glistening; supraclypeal area with widely separated strong punctures; tegulæ black; a conspicuous white hair-band between mesothorax and scutellum; hind basitarsi with the anterior margin more distinctly curved; sixth tergite shorter, with hardly any lip-like extension, and its surface conspicuously grey-tomentose, with black hairs intermixed; second recurrent nervure almost meeting outer intercubitus; mandibles with a line of pale orange hair just before cutting-edge; wings dusky, especially in the costal region.

One specimen. Yucatan: Chichenitza (*Bequaert*).

### *Megachile petulans abnegata*, subsp. n.

♂ (type).—Smaller (length about 8·6 mm.).

Hair of face and front white, with a very faint yellowish tint; eyes strongly converging below; thorax less hairy, and the pale hair white (white band behind mesothorax, and spots next to tegulæ, very distinct); tegulæ practically black; dense tomentum covering sixth tergite ochreous, apical emargination much more shallow; hind tarsi, and their tibiæ at apex, dark red; the other tarsi red apically; much black hair on vertex and scutellum; the anterior coxæ are spined, but the tarsi are simple; the antennæ are very long and black.

♀.—Length about 11 mm.

Clypeus very densely punctured, the shining lower margin crenulate; supraclypeal area densely punctured and dull, obtusely elevated and somewhat shining in middle (in *petulans* shining, with well-separated punctures); mandibles shorter; ventral scopa more or less reddish or orange.

One male and three females. Yucatan: Chichenitza (*Bequaert*).

The female is also very close to *M. mexicana*, Cresson, but differs by the densely punctured supraclypeal area, the narrower face, the purer white of hair at sides of face, the entirely black legs, the less distinct abdominal bands, and the lack of long black hair at extreme sides of abdomen. The ventral scopa, however, is like that of *M. mexicana*.

### *Megachile adempta*, sp. n.

♀.—Length about 10·5 mm., anterior wing 8 mm.

Black, robust, with apical part of scape, flagellum, and greater part of mandibles dark chestnut-red; legs chestnut-red, the femora blackened beneath, anterior trochanters dark, but middle ones with apical half clear red, middle femora light ferruginous above; abdomen black, with some red at extreme sides of first segment, not visible from above; face broad; clypeus coarsely and densely punctured, without a smooth middle line, lower margin crenulate, shallowly emarginate in middle; supraclypeal area densely punctured;

face and front with rather dull white hair, thin on clypeus, a transverse band of fulvous hair in region of ocelli; vertex with pale fulvous hair; thorax above with short very pale fulvous hair, whitish in front, and becoming suffusedly ferruginous at sides; pleura with abundant dull white hair; tegulæ bright ferruginous. Wings hyaline, orange-tinted, with ferruginous stigma and nervures; first recurrent nervure ending fully twice as far from base of second cubital cell as second from apex; spurs whitish; hind basitarsi broad, but not quite as broad as tibiæ. Abdomen with long ochreous hair on first tergite; tergites 1 to 5 with entire ochreous hair-bands; sixth with very short pale hair, and no long hairs; ventral scopa pale yellowish, white at base, without any black.

One specimen. Yucatan: Chichenitza (*Bequaert*).

### *Megachile animosa*, sp. n.

♀.—Length about 12·2 mm.

Very broad, black, including mandibles, antennæ, tegulæ, and legs, but tergites 3 to 5 distinctly green; pale hair white, but red on inner side of tarsi, and ventral scopa long and entirely very bright ferruginous; head broad; eyes dark brown; mandibles quadridentate; clypeus closely punctured, but glistening, with a smooth median line, the lower margin very slightly excavated in middle; supraclypeal area well punctured, but its lower margin broadly shining; sides of face and cheeks with pure white hair, region of antennæ and front with dull white mixed with black; vertex bare, with erect black hairs along hind margin; mesothorax and scutellum closely punctured; upper margin of prothorax at sides, tubercles, spot above tegulæ, and bands before and behind (the latter narrow) scutellum, of dense pure white hair; some black hairs along hind margin of scutellum. Wings dusky hyaline, stigma dark reddish, nervures dark brown; spurs white; hair of legs mainly white, reddish on outer side of middle tarsi; hind basitarsi hardly as broad as tibiæ. Abdomen short, with rather dull white hair-bands on first four tergites, the last two broadly interrupted (perhaps entire when quite fresh); sixth tergite grey from a covering of fine appressed hair, but without long outstanding hairs.

One specimen. Yucatan: Chichenitza (*Bequaert*).

Very close to the South American *M. pyrrhotricha*, Ckll., but distinct by the larger, dullish, punctured scutellum and axillæ, the white dorsal abdominal bands, and the black hind tarsi.

### *Megachile acculta*, sp. n.

♀.—Length about 11 mm.

Moderately broad, black, including the shining elongate mandibles, antennæ, and legs, the tegulæ also practically black, very slightly brownish; head broad; clypeus shining but strongly punctured, short, with recumbent pale ochreous hair which extends far beyond the margin; supraclypeal region strongly punctured; front with long pale ochreous hair, the dense hair between antennæ forming a sort of reversed V; lower part of cheeks with white hair; vertex dull, excessively densely and minutely punctured; mesothorax and scutellum dull, with rather short erect black hair, but clear pale yellow hair forms a broad band at front of mesothorax (interrupted in middle), spots over tegulæ, band behind mesothorax, and a weak band behind scutellum; hair on tubercles and tufts behind wings pale yellow, but mesopleura with white hair. Wings hyaline, the apical margin broadly dusky; stigma subobsolete, dull yellowish, nervures fuscous. Legs practically as in *M. candida*, the second to fourth joints of middle tarsi greatly produced laterally. Abdomen with rather narrow yellow hair-bands, sixth tergite thinly yellowish pruinose, the general effect dark (in *M. candida* it is thickly covered with yellow hair); ventral scopa pale yellow.

One specimen. Yucatan: Chichenitza (*Bequaert*).

Very close to *M. candida*, Smith (Mexico), but distinguished by the last tergite as described and the dusky outer margin of the wings.

### *Stelis yucatanica*, sp. n.

♀ (type).—Length about 7·5 mm.

Black, with pale yellow (cream-coloured) markings as follows:—Small elongate marks in front of top of eyes, a short band (broken in middle) on top of head, lines along lateral margins of mesothorax, with greatly expanded extension on anterior margin (leaving middle third black), spots on axillæ, narrow band on scutellum, broad entire band on first tergite (with an anterior middle point and broadly shallowly excavated sublaterally behind), small mark at each side of second tergite, bands on third and fourth tergites (excavated sublaterally anteriorly) and a very narrow band on fifth; clypeus and mandibles wholly black; sides of face covered with silvery hair, and the tegument in this region either practically all dark or variably pallid, forming rather obscure lateral face-marks, which sometimes extend upward nearly to meet the distinct marks in front of upper part of eye; supraclypeal area obtusely ridged in middle; antennæ dark; head closely punctured; mesothorax with large punctures; scutellum shining, with widely separated punctures; tegulæ black, with a dusky yellowish mark on outer side; basal area of metathorax very coarsely fluted and sharply defined. Wings smoky, deep fuliginous in upper part of anterior pair; second recurrent nervure going a moderate distance beyond second cubital cell. Legs black. Abdomen shining, well punctured, the apical part with fine glittering white hair; a little red colour at apex of last sternite.

♂.—Similar, except for the sexual characters, but spots on tegulæ much reduced, and no narrow lines at sides of mesothorax; sixth tergite keeled in middle and with a pair of suffused reddish-yellow spots. A second male is a dwarf, about 6·3 mm. long, and has the stripes at sides of mesothorax, though weakened, and the spots on sixth tergite are nearly obsolete.

Five females and two females. Yucatan: Chichenitza (*Bequaert*).

A distinct species, superficially resembling the *Hypanthidium* of the same locality, and very probably parasitic on it. The first two tergites are all black in *S. verœcrucis*, Ckll. (Mexico), and *S. abnormis*, Friese (Costa Rica). Three other species described from Costa Rica by Friese are evidently different.

### *Stelis abnormis*, Friese, 1925.

♀.—Chichenitza, Yucatan, Feb. 1930 (*G. C. Shattuck*).

Described from San José de Costa Rica, where it was collected on *Capsicum*, *Salvia*, and *Leonurus*, and was supposed to be parasitic in nests of *Euglossa*. The specimen differs from the description in having a long yellow band on middle femora beneath. The second recurrent nervure ends a short distance beyond the end of second cubital cell. The triangular process at the base of the mandibles above is as in *S. cornuta*, Bingham, from Rangoon, Burma. The size, robust form, yellow stripes on disc of mesothorax, and fulvous colour along costal margin of wings are also as in *S. cornuta*. The area of metathorax is large, triangular, shining in middle, punctured at sides, and has a median channel. The coarsely sculptured scutellum has the yellow-banded apex protuberant, but obtuse. The yellow band on cheeks is some distance from the orbit, as in *S. cornuta*. I have no doubt that these insects, so widely separated geographically, belong to a distinct group, at least of subgeneric rank, which may be called *Odontostelis*.

Type, *S. abnormis*, Friese.

### *Stelis shattucki*, sp. n.

♂.—Length 7·5 mm., with abdomen curved downward; anterior wing a little over 6 mm.

A relatively elongated, narrow species (compare *Anthidium costaricense*, Friese), black, with the head entirely black; mesothorax with two transverse yellow marks on anterior margin, and a transverse band on scutellum, but no other yellow on thorax; abdominal markings obscure, not coloured up, but doubtless should be yellow, consisting of a transverse band across middle of first tergite, a small marginal mark at each side of second tergite, a transverse band on third (broadly emarginate on each side sublaterally), a similar but rather narrower band on fourth, and a band entirely failing laterally on fifth; apical tergites black; legs black, flagellum short, very faintly brownish beneath; tegulæ black; wings fuliginous, greatly darkened in upper part, including marginal cell, there shining violaceous; basal nervure meeting nervulus; second recurrent going a short distance beyond second cubital cell; pulvilli very distinct.

The scanty pubescence is dull white, spreading and abundant at sides of face; a conspicuous tuft at each side of metathorax; clypeus excessively densely punctured; vertex with very large well-separated punctures; mesothorax and scutellum punctured like vertex; metathorax truncate posteriorly, but the base dorsally with very coarse rugæ; spurs dark brown; abdomen shining, with strong but not dense punctures; sixth tergite with margin simple, no apical spines; the tergites bulge laterally.

Yucatan: Chicheuitza, Feb. 1930 (*G. C. Shattuck*).

This is a peculiar species, resembling very much *Stelis yucatanica*, Ckll., but with different markings, and the first recurrent nervure ending very much nearer base of second cubital cell. By the same token, it resembles *Hypanthidium yucatanicum*, Ckll., but the basal sculptured band of metathorax is very broad and entirely different, and there are many other differences in detail. Having only the male, I had to consider whether this might be an aberrant *Dianthidium*, but the structure of the metathorax appears to be decisive for *Stelis*. The South American *Stelis nuda* was originally described by Schrottky as *Dianthidium nudum*.

### *Ashmeadiella bequaerti*, sp. n.

♂.—Length a little over 5 mm., anterior wing 3·6.

Black, without any red, except that the mandibles are obscurely reddish subapically; flagellum dark brownish beneath; tegulæ reddish black; wings greyish hyaline, distinctly dusky; pubescence entirely white, long in region of scutellum; eyes greyish green, blackened anteriorly; clypeus with dense strong punctures, running more or less into longitudinal grooves, the intervals shining; front and vertex more finely and excessively densely punctured; mesothorax and scutellum densely punctured, but shining; area of metathorax a narrow band, finely cross-striated; abdomen shining, finely punctured, with very narrow white hair-bands; the four apical teeth broad and short, the inner pair longer and slender and all dark; first recurrent nervure ending far from base of second cubital cell.

One male. Yucatan: Chichenitza (*Bequaert*).

The following table separates it from related species:—

| | | |
|---|---|---|
| 1. | Hair of scutellum tinged with yellow; wings clear; abdominal bands very distinct .. | *echinocacti*, Cockerell. |
| | Hair of scutellum white ............... | 2. |
| 2. | Wings dusky; abdominal bands weak .... | *bequaerti*, Cockerell. |
| | Wings clear or milky ................. | 3. |
| 3. | Tegulæ pale; flagellum red beneath ...... | *aridula*, Cockerell. |
| | Tegulæ dark ......................... | 4. |
| 4. | Vertex shining ....................... | *wislizeni*, Cockerell. |
| | Vertex very densely punctured, hardly shining ......................... | *cactorum*, Cockerell. |

*Ashmeadiella* is richly represented at Guaymas and Sonora (four species) and on the islands in the Gulf of California, but is not otherwise known from Mexico or Central America. The present insect therefore represents a great extension of the known range of the genus.

### *Heriades carinata*, Cresson, var. *purpurascens*, nov.

♀.—Length 5 to 6 mm.

Black, with white pubescence, the ventral scopa white; eyes dark purplish; tegulæ black; wings quite strongly dusky; first recurrent nervure joining second cubital cell a little nearer to base than second to apex; punctures of third tergite very large, very different from the fine punctures of second.

This differs from *H. carinata*, Cresson, in the colour of the eyes, but in no other obvious character. The male, when known, may show structural differences.

Two females.

I have genuine *H. carinata* from as far south as Tlacotalpam in Vera Cruz (*Townsend*).

It is a singular fact that, whereas *Heriades* is very richly represented in South Africa, it appears to be totally absent from S. America. The single record in Dalla Torre's Catalogue is an error. Its southernmost limit in Central America is Costa Rica, whence Titus and Friese have each described a species. These Costa Rica forms have the ventral scopa rich yellow (*H. bruneri*, Titus) or yellowish brown (*H. rufocaudatus*, Friese).

One might infer that *Heriades* had reached America in comparatively recent times, but it is represented by quite numerous species in the Miocene shales of Florissant.

### *Hypanthidium yucatanicum*, sp. n.

♀ (type).—Length about 7 mm., anterior wing 6·5.

Black, rather narrow, with pale yellow markings, consisting of long-cuneate lateral face-marks (beginning obliquely about level of top of clypeus, and extending upward, gradually narrowing, to a point on orbital margin nearly level with anterior ocellus), narrow entire occipital band reaching upper end of cheeks, anterior margin of mesothorax narrowly (widely interrupted in middle and extending at sides to a point above tegulæ), a rather broad curved band including axillæ and hind margin of scutellum, stripes on underside of front and middle femora, large transverse mark at each side of first tergite, small marks at extreme sides of second, small marks at sides of third, and discal bands (failing laterally) on third to fifth (on fourth narrowly interrupted); orbits converging below; clypeus and mandibles wholly black; scape with a reddish-yellow stripe in front; flagellum obscurely reddish beneath; head densely and strongly punctured, punctures on mesothorax larger; tegulæ large, reddish black, with reddened margins. Wings fuliginous, the region below the costa darker; second recurrent nervure going far beyond end of second cubital cell. Tibiæ and tarsi with white hair on outer side, but ferruginous on inner side of tarsi; anterior tibiæ ferruginous in front; hind spur very long, curved at end. Abdomen shining, well punctured; ventral scopa pure white.

♂.—Similar, but clypeus, lateral marks extending downward to fill space between clypeus and eyes, and small spots at lower corners of supraclypeal area, all pale dull yellowish; light occipital band broken in middle; band on third tergite extended to extreme sides (thus uniting with the lateral marks); apex very broadly and obliquely rounded; the hind coxæ are obtusely subangulate, not spined; there is a small light mark on sixth tergite.

Yucatan: Chichenitza (*Bequaert*).

Related to a little group of species occurring in Central and South America. The following table brings out the differences:—

| | | |
|---|---|---|
| 1. | Females, clypeus black, or with small light marks | 2. |
| | Males, clypeus wholly light | 3. |
| 2. | Lateral face-marks very pale yellow, pointed above | *yucatanicum*, Cockerell. |
| | Lateral face-marks orange, very obtuse above | *ecuadorium* (Friese). |
| 3. | Tegulæ clear light ferruginous | 4. |
| | Tegulæ black or reddish black | 5. |
| 4. | First tergite without yellow marks | *taboganum*, Cockerell. |
| | First tergite with very large orange marks | *ecuadorium* (Friese). |
| 5. | Abdomen with very broad orange bands on tergites 3 to 6 | *mexicanum* (Cresson). |
| | Abdomen with narrow cream-coloured bands on tergites 3 to 5 and a small mark on 6 | *yucatanicum*, Cockerell. |

### *Cœlioxys ardescens yucatanica*, subsp. n.

♀.—Clypeus and supraclypeal area densely punctured, without any evident ridge or keel; wings somewhat darker.

One female. Yucatan: Chichenitza (*Bequaert*).

*C. bimaculata*, Friese, is a synonym of *C. ardescens*, Cockerell. He refers to the keeled supraclypeal area. The species is widely distributed in South America, but Friese cites it also from Orizaba, Mexico. Probably the specimen from that locality belongs to the subsp. *yucatanica*, but it is in the Vienna Museum, and I have not seen it.

### *Cœlioxys speculifera*, sp. n.

♀.—Length 10·8 mm.

Black, with the mandibles (except the teeth) dusky red; the tegulæ, legs (except black hind tarsi), first tergite (except narrow hind margin), sides of tergites 2 to 5 (the red progressively decreasing in amount), and venter (except last sternite) all chestnut-red; hair of eyes very short; face and front with mainly white hair, sides of upper part of clypeus appearing brown, and short broad brown bands, margined with white, on each side of upper part of front; antennæ long, entirely black; vertex sparsely punctured;

cheeks with pure white hair, the grooved space covered with hair; mesothorax polished, with well-spaced strong punctures, its anterior and lateral margins with narrow bands of white hair, slightly tinged with ochreous, the anterior band curved on each side, and broken in middle; a band also in scutello-mesothoracic suture, and one behind scutellum; scutellum smooth, almost without punctures, very prominently dentate in middle; axillar spines black, very long, slightly curved; posterior face of thorax dull. Wings fuliginous in upper part of marginal cell and apical field, nervures dark; first recurrent nervure ending a little more distant from base of second cubital cell than second from apex. Legs with pure white hair, forming stripes on femora and tibiæ; spurs red. Abdomen shining, sparsely punctured; five narrow entire very distinct white hair-bands; second tergite transversely grooved at sides, but without any fovea; last tergite keeled, its apical portion beak-like; apical sternite extending beyond tergite, slender, with a prominent projecting point, its sides thickly fringed with long black hair; venter shining, sparsely punctured, but last sternite black and entirely dull.

One female. Yucatan: Chichenitza (*Bequaert*).

In my table this goes to *C. tepaneca*, Cresson, which differs in the caudal structures &c. The structure of the caudal end is similar in many respects to that of *C. gigantea*, Friese, which, however, is 18–19·5 mm. long, with the apical sternite much more produced.

### *Cœlioxys bequaertiana*, sp. n.

♀.—Length about 10 mm.

Black, with the mandibles (except teeth) dusky red; anterior part of mesothorax, except in middle, suffused with red; upper part of pleura obscurely reddish; scutellum chestnut-red; tegulæ and legs (including hind tarsi) red; abdomen with dark red spots at extreme sides of first three tergites, and the venter dusky red; face and clypeus densely covered with white hair, in part tinged with ochreous; eyes with very short hair; clypeus normal, but from its lower margin projects a long brush of white hair, presenting a linear median break or interval; cheeks with dense white hair; antennæ black, the scape a little red at apex; occiput with a long fringe of white hair; mesothorax polished, the middle with small very sparse punctures, the sublateral areas with very large punctures, more or less in grooves; scutellum with few very large punctures, none in middle, the apical margin produced into a prominent dentiform angle; axillar spines long, red. Wings infuscated apically, stigma dark red, nervures dark brown. Legs with white hair, spurs red. Abdomen shining, the punctures smaller and denser on basal portion of tergites; tergites 4 and 5, except at base, practically impunctate; middle of all the tergites smooth and hardly or not punctured in apical portion; sixth tergite keeled, broadly beak-like, not upturned at tip; apical sternite straight, narrow, black, not fringed, largely overlapped by the red, produced and pointed penultimate sternite; the apical sternite is not notched at sides; hair-bands, above and below, white.

Two females. Yucatan: Chichenitza (*Bequaert*).

Somewhat related to *C. schulthessi*, Friese, but so similar to *C. azteca*, Cresson, that I might have questioned my interpretation of Cresson's description, had I not myself examined his types and seen the very different clypeal structure.

In 1914 I described *C. costaricensis*, from Costa Rica. The *C. costaricensis* of Friese, 1916, is a different species, and may be called *C. burgdorfi*, n. n., after the collector.

### *Nomada nitidiceps*, sp. n.

♀.—Length about 7 mm.

Black, with lemon-yellow markings on thorax and abdomen, the following parts being yellow: tubercles, upper border of prothorax, two large subtriangular spots on scutellum, transverse band on postscutellum, rather broad apical band on first tergite (almost broken in middle, and with a deep rounded excavation on each side in front), band on second tergite (very broad laterally, but broken in middle, the ends mesad sharply pointed), lateral cuneiform marks (excavated behind) on third tergite, and bands on fourth and fifth interrupted in middle; head very broad; eyes dark brown; mandibles dark rufous, simple; tegument of head all black except a small elongate orange mark on each side near eyes at level of antennæ; face shining, sparsely punctured; most of front with dense strong punctures; scape ordinary, ferruginous in front, flagellum dusky ferruginous beneath; third antennal joint distinctly longer than fourth; mesothorax densely and very coarsely punctured; area of metathorax dull in middle and shining at each side; posterior face of metathorax covered with fine pale hair; mesopleura densely and coarsely punctured, all black; tegulæ dark brown. Wings dusky hyaline, fuliginous apically, stigma red, nervures dark fuscous; basal nervure falling just short of nervulus; second cubital cell large and square, receiving recurrent nervure a little beyond middle; third cubital cell short, no longer than second. Legs very dark brown, the hind femora black, reddened at apex; anterior tibiæ and tarsi quite rufous. Abdomen for the most part finely and very densely, but conspicuously, punctured, but first tergite smooth, shining, the punctures excessively fine; fifth tergite with a large apical semilunar hairy patch; apical plate not exposed; venter entirely dark, with fine pruinose pubescence.

One female. Yucatan: Chichenitza (*Bequaert*).

This resembles in aspect some of the Central American species, but is quite distinct, and by the apical hairy patch falls in the group of *N. depressa*, Cresson (see Entom. News, 1908, p. 323).

### *Ceratina itzarum*, sp. n.

♂ (type).—Length 5 to 6 mm.

Brilliant blue shaded with emerald-green, the face and cheeks green, the thorax green posteriorly, including postscutellum, and largely so at sides; abdomen with basal half mainly green, the second and third tergites with the base broadly dark brown; face-marks pale orange, on clypeus including lower margin and a very large cuneiform upward extension; the pale colour also includes short rod-like lateral marks, mandibles except apex, and labrum, the latter having three dark spots; head and thorax well punctured, the disc of mesothorax punctured all over, but shining between the punctures; cheeks sparsely punctured; occipital margin with a sharp raised edge; scape black, flagellum very obscurely brown beneath; head and thorax almost without pubescence; tegulæ rufo-fulvous posteriorly; anteriorly dark, with a light yellow spot. Wings hyaline, very faintly dusky apically; stigma and nervures dark brown. Legs with coxæ, trochanters, and femora metallic green; anterior femora pale rufous above, with a cream-coloured apical spot; anterior tibiæ dark reddish, with a cream-coloured band in front; the other tibiæ and tarsi dark brown, with pale hair; middle femora obtusely triangularly produced beneath, hind femora conspicuously broadened before middle. Abdomen well punctured, subapically rugose as usual; apex broadly excavated or concave in outline, with a small protuberance at each corner; venter with thin white hair. In a variation, the head and thorax are entirely green.

♀.—Length about 7 mm.

Similar, but for the usual sexual characters; face-marks reduced to a rather small cream-coloured spot at apex of clypeus; labrum and mandibles black; hind tibiæ and tarsi with much white hair; apex of abdomen pointed.

Yucatan: Chichenitza (*Bequaert*).

Three of each sex. The itzas were the priests at Chichenitza. This species is so close to *C. cobaltina*, Cresson, from Mexico, that it may be only a race; but it is larger, with densely punctured pleura, different face-marks, &c.

### *Ceratina yucatanica*, sp. n.

♀.—Length about 7 mm.; anterior wing 5·3 mm.

Emerald-green, with strong blue tints on vertex; densely punctured, on mesothorax finely, the posterior disc mainly polished and impunctate; lower margin of clypeus black, with a small central white spot, above which is a black dagger-shaped mark pointing upward; labrum and mandibles black; antennæ black; cheeks sparsely punctured; area of metathorax dull; tegulæ black; wings rather conspicuously dusky, stigma very dark; legs black, with pale hair, the coxæ green; abdomen with the bases of second and third tergites metallic like the rest.

One female. Yucatan: Chichenitza (*Bequaert*).

Very like *C. itzarum*, but distinct; and also very close to the Cuban *C. cyaniventris*, Cresson, which must be derived from the same stock. The Cuban bee has the legs green.

In connection with bright green Neotropical *Ceratina*, it will be useful to note that *C. ecuadoria*, Friese, 1916, is exactly the same as *C. triangulifera*, Cockerell, 1915.

### *Ceratina parignara*, sp. n.

♂.—Length about 6·5 mm.; anterior wing about 5.

Dark olive-green, with the smooth disc of mesothorax black; eyes converging below; yellow face-marks (reddened by cyanide in type), consisting of clypeus except lateral margins before the apical expansion, small and inconspicuous lateral spots, large patch on labrum with a black spot on its upper part, and short mark on mandibles; antennæ black, the flagellum long, and obscurely reddish beneath; cheeks, pleura, and region of scutellum with white hair; cheeks broadly rounded, with sparse strong punctures; tegulæ black. Wings rather strongly dusky, with iridescent tints, stigma black. Legs black, the small joints of tarsi ferruginous; hind femora obtusely angled below. Abdomen rather closely punctured, the apex beneath broadly truncate.

One male. Yucatan: Chichenitza (*Bequaert*).

Compared with *C. nara*, Strand, this is evidently related, but has a broader dark olive-green (instead of yellowish-green) abdomen; while *C. nara* has a smaller head and thorax, with the labrum entirely black. I thought it might be the male of *C. ignara*, Cresson, but the vertex is yellowish green (blue-black in a Cresson cotype of *C. ignara*), and the area of metathorax is shorter and finely rugose. I had *C. nara* (from Guatemala) as the male of *C. ignara*, but Strand describes a different insect as the true male of Cresson's species. In H. S. Smith's table (1907) this runs out at 10, because the apical plate is broadly truncate, and the mandibles have a light spot. Ignoring the last feature, it runs to *C. tejonensis*, Cresson, differing by the lateral face-marks.

### *Ceratina viridicincta*, sp. n.

♀.—Length 9 to 10 mm.

Robust, strongly punctured, the scanty pubescence white; face broad, very coarsely punctured at sides; clypeus with a very broad ivory-coloured median band, broadest below; no lateral face-marks proper, but small rounded marks on lateral expansions of clypeus; labrum and mandibles black, the former very coarsely rugoso-punctate; sides of face and region about base of antennæ green, more or less brilliant; upper part of front and vertex bronze-black, the mesothorax also bronzy black, narrowly green along lateral and posterior margins; cheeks green, with rather sparse strong punctures; scutellum purplish black, green at sides and behind; post-scutellum and metathorax green, the area of latter shining along margins; tubercles black; mesopleura dark green, strongly punctured; tegulæ rufo-testaceous, dark in front. Wings hyaline, rather dusky, stigma and nervures reddish brown; first recurrent nervure reaching second cubital cell near end. Legs black, with long pale hair on hind tibiæ and tarsi; anterior femora dark green, with a light yellow spot on knees, their tibiæ with a yellow stripe; hind knees with a yellow spot. Abdomen very broad, first tergite shining green, flushed with coppery; tergites 2 and 3 dark purplish with green margins; 4 and 5 almost black at base, with golden-green margins, the junction of the colours rosy; apex very rugose, black; venter with thin white hair.

Two females. Yucatan: Chichenitza (*Bequaert*).

This handsome species in H. S. Smith's table runs nowhere, but it might fall near *B. amabilis*, Cockerell, the supposed lateral face-marks of which (as given in Smith's table) are really clypeal. *C. amabilis* is quite differently coloured, and could not be confused.

### *Augochlora viridinitens*, sp. n.

♀.—Length about 9 mm., anterior wing 7·2 mm.

Robust, with black, green, and purple colours; pubescence scanty, dull white, short on head and thorax above; head large, eyes deeply emarginate, cheeks broad; mandibles black, strongly bidentate; process of labrum truncate, but with a median apical pit or depression; head mainly black, but band between antennæ, and large spot at each side of antennæ, brilliant green, supraclypeal area and sides of face and front more or less purplish; clypeus well punctured, mottled with green and purplish; cheeks bluish green; scape very long, black; flagellum dull red beneath; angles of pronotum hardly developed; tubercles bright green; mesothorax purple-black, with sublateral stripes, and lateral and posterior margins, blue-green; punctures of mesothorax very small and dense, the surface dull; scutellum densely punctured, purple on disc, otherwise green; postscutellum green; metathorax green, with the well-defined finely striated enclosure purple; sides of thorax dark purplish with green sutures; tegulæ dark reddish brown, outwardly much paler. Wings greyish hyaline; stigma quite large, dull orange-fulvous; nervures fuscous; second cubital cell higher than long; first recurrent nervure meeting intercubitus. Legs black, without metallic tints, with pale hair; spurs red. Abdomen shining black, finely and weakly punctured; first tergite brilliant green at sides, and crimson at basal middle; second and third tergites partly green at sides; thin silvery hair on tergites, but no conspicuous bands; ventral spine long, straight and black.

One female. Yucatan: Chichenitza (*Bequaert*).

Allied to *A. nigrocyanea*, but easily known by the coloration, as described.

### *Augochlora cyanaspis*, sp. n.

♀.—Length about 9·3 mm., anterior wing 7 mm.

Moderately robust, black, with a blue-green streak along inner orbits; postscutellum, area of metathorax, and hind margin of scutellum deep purple-blue; tubercles steel-blue; mesopleura dark purple-blue; sides of metathorax more or less blue; first two tergites, and third very slightly, suffusedly green at sides; legs black; mandibles with a very slight or more evident reddish suffusion; scape very long, black; flagellum short, dull ferruginous beneath except at base; in the cotype the tubercles, scutellum, and abdomen are entirely black; head ordinary; eyes deeply emarginate; process of labrum truncate, its surface plicatulate; clypeus shining, except a square dull patch at each upper corner, lower part strongly but not densely punctured, conspicuously depressed at apical middle; supraclypeal area prominent, entirely dull, front and vertex dull, a little shining surface next to ocelli; hair of head and thorax scanty and short, dull white on face and pleura, black on vertex, mesothorax, and scutellum; mesothorax dull and very finely and closely punctured; scutellum similar, but more shining, bigibbous, with a strong median sulcus, the tops of the swellings bluish; area of metathorax poorly defined, with an excessively fine linear sculpture, producing a dull surface, and no plicæ; posterior truncation sharply defined only at lower end; tegulæ dark reddish brown, broadly pallid anteriorly. Wings conspicuously dusky, stigma and nervures brown; second cubital cell square, receiving recurrent nervure at apical corner. Legs with largely pale hair, but black on outer side of tibiæ and tarsi; hair on inner side of hind tarsi dark, not red; spurs dull red. Abdomen moderately shining, the punctures very fine and weak; there is more or less fine short silvery pubescence; apex with black hair; venter with long outstanding dull white hair.

Two females. Yucatan: Chichenitza (*Bequaert*).

Allied to *A. albiceps*, Friese, but differs in coloration and in hair of legs. It is possible, but I think not probable, that it is the female of *A. cærulescens*, Friese. Compared with *A. quiriguensis*, Cockerell, it is larger, with the head and thorax quite differently coloured, though the abdomen is nearly the same. *A. quiriguensis sidæfoliæ*, Cockerell, is rather more similar, but the fine yet distinct plications of the area of metathorax are distinctive, as well as various points of coloration.

### *Augochlora gemmicauda*, sp. n.

♀.—Length about 10 mm., anterior wing 8.

Robust, with broad abdomen, but head rather small; head and thorax brilliant emerald-green; mandibles black; clypeus convex, smooth, with scattered strong punctures, its greater part black, but sides and upper end green, with crimson between the red and the green; lower margin of clypeus thickly fringed with long greyish hair; cheeks, sides of face, and occiput with thin white hair, but vertex with black; flagellum obscurely reddish beneath, especially at apex; front dull and rugose, but a transverse shining band just above antennæ; angles of pronotum prominent, but much wider than a right angle; mesothorax dull and rugose, with short black hair; at sides of scutellum and on postscutellum the hair is long and pale brownish grey; scutellum finely punctured, with a median groove and two golden-coppery spots; metathorax polished, with a finely rugose band at the base, including about half the basal area, but failing laterally; sides of metathorax suffused with golden; tegulæ black, with a green spot in front. Wings dusky hyaline, the outer field darker, stigma and nervures reddish brown; second cubital cell a little broader than high, receiving first recurrent nervure well before the end. Legs black, front and middle femora green behind, and outer side of their tibiæ brilliant green; hair of legs largely black, long and grey on under side of hind femora, black on outer side of hind tibiæ and tarsi, but pale reddish on inner side, but appearing dark when seen from one angle; hind spur with six very long strong spines. Abdomen with long erect white hair at base; vibrissal fringe on first two tergites very distinct, red; first two tergites dark purple-blue, suffused with crimson at sides; remaining tergites brilliant rosy-crimson; venter with dull white hair, dark fuscous subapically.

One female. Yucatan: Chichenitza (*Bequaert*).

A beautiful species, evidently related to *A. nigriscopis*, Vachal, and to *A. pendens*, Vachal, the latter regarded by Vachal as perhaps a variety of *A. nigriscopis*. It differs from *A. nigriscopis* by the black tegulæ, absence of blue on head and thorax, and bicoloured abdomen; probably also in other characters not mentioned in Vachal's brief account. Vachal suggests that *A. nigriscopis* may be *A. vesta*, Smith; the present insect is very different from *A. vesta*.

## LXXVII.—*A new Palæarctic* Chesias (*Lepidoptera*, Geometridæ). By Louis B. Prout.

### *Chesias leuconeura*, sp. n.

♀.—32 mm.

Head and body light drab or drab-grey, mixed with white; the tegula almost white. Fore tibia with the inner claw moderate, the outer present, but vestigial.

*Fore wing* a little narrower than in typical *Chesias*, costa very gently arched, termen strongly oblique, only a little curved; costal edge (broadly in proximal part), a broad terminal line (proximal to the usual slender dark one), and the veins (except in terminal area) white, *M* rather broadly so; a broad oblique white dash behind distal areole (*i. e*, from $DC^2$ about to branching of $SC^5$), much as is observable in many forms of *rufata*, Fb.; interspaces brownish drab, proximally in part so strongly irrorated with blackish as to appear fuscescent; an ill-defined, slightly curved streak from apical dash to bifurcation of $R^3$ and $M^1$ brighter brown (more buff), cut by the white veins; a fine blackish apical dash behind the white one; from this dash broadens gradually the grey (distally more drab or brownish) distal area, much as in *rufata*, but bisected by a broader, whiter subterminal line, which curves more strongly behind, running to termen just in front of $SM^2$; terminal line weakened at the veins, but scarcely interrupted; fringe white, weakly mottled.

*Hind wing* shaped about as in *rufata* or slightly narrower; smoke-grey, slightly tinged with drab; fringe white.

Fore wing beneath grey, with faint indications of markings, at least of the subterminal line. Hind wing beneath dirty white.

Angora, 1930 (*Sureya Bey*), 2 ♀♀ in coll. Brit Mus., kindly presented by the discoverer.

Possibly nearer to "*Lithostege*" *notata*, B.-Haas (1906), than to typical *Chesias*, Tr. (1825); but on account of the curved costa, glossy wings, and rather simple fore-tibial armature I have associated it with the latter, which in any case has the prior name; it is becoming increasingly clear that there is no sharp demarcation, and that Meyrick and others have been wise in sinking *Lithostege*.

## LXXVIII.—*Nouveaux Hétéromères d'Afrique* (*Col.*).

Par M. Pic.

Les nouveautés ci-dessous décrites font partie des collections du British Museum.

### *Eustrophinus atromaculatus*, sp. n.

Oblongo-elongatus, postice valde attenuatus, nitidus, sat sparse luteo pubescens, diverse rufus, thorace postice nigro bimaculato et elytris in singulo et in disco ante et post medium nigro maculatis. Oculis approximatis, antennis crassis, piceis ad basin rufis; thorace brevi et lato, antice medio subarcuato et marginato, angulis posticis fere rectis, minute et sparse punctato, ad basin bi-impresso, lobo medio late subarcuato; scutello mediocre, sparse punctato; elytris thorace non latioribus, marginatis, longe attenuatis, minute striato-punctatis, intervallis latis, multi-punctatis.

Long. 7 mm.

Voisin de *E. circumcinctus*, Chp., s'en distingue facilement par sa forme moins allongée, les élytres plus élargis vers les épaules et surtout par les dessins foncés maculiformes des élytres.

Uganda.

### *Macrosiagon longicolle*, sp. n.

Elongatus, elytris apice breve dehiscentibus et subacuminatis, sat nitidus, sparse et breve griseo pubescens, niger, elytris testaceis, apice paulo brunnescentibus, labro, antennis ad basin (his fractis) palpisque testaceis, tibiis tarsisque pro parte rufis. Capite elongato, postice parum elevato, arcuato, nitidissimo, minute et sparse punctato; thorace longissimo, antice attenuato, parum nitido, fortiter et dense punctato, ad basin sinuato, bi-impresso, lobo non elevato, triangulare; scutello minutissimo, parum distincto; elytris thorace non latioribus, parum elongatis, postice attenuatis, breve dehiscentibus et apice subacuminatis, sat fortiter et dense punctatis.

Long. 4 mm.

Cette petite espèce, qui peut prendre place près de *M. axillare*, Gerst., est caractérisée par son long prothorax joint à la coloration presque uniforme et claire des élytres.

Uganda (*C. C. Gowdey*).

### *Glipa luteofasciata*, sp. n.

Elongata, postice attenuata opaca, nigra, pro parte griseo, pro parte luteo pubescens, elytris signaturis luteis (maculis plurimis

anticis et internis, macula elongata humeralis, fascia antemediana obliqua, fascia anteapicalis recta) ornatis. Capite robusto griseo aut luteo pubescente, antennis nigris; thorace brevi et lato, lateraliter subarcuato, dense punctato, multo et diverse griseo undulato-fasciato; scutello triangulare, luteo pubescente; elytris thorace paulo angustioribus, sat elongatis, postice paulo attenuatis, apice subarcuatis, nigris, signaturis luteis aut luteo griseis ornatis; infra corpore pro parte griseo aut luteo pubescente; pygidio brevi, apice lato, truncato; pedibus nigris, posticis validis.

Long. 8 mm.

Espèce reconnaissable à première vue, par la disposition de ses bandes jaunes élytrales, l'antérieure oblique, placée un peu avant le milieu, et la postérieure droite, assez loin du sommet. A placer près de *G. aurocaudata*, Frm.

Nyasaland (*R. C. Wood*).

### *Mordella woodi*, sp. n.

Oblongo-elongata, postice attenuata, subnitida, griseo pubescens et albo notata, nigra, elytris in singulo antice albo bimaculatis et postice albo uni-maculatis, maculis anticis oblique dispositis, maculis internis ad suturam approximatis. Capite robusto; thorace parum brevi, sat lato, longitudinaliter albo vittato; scutello parum pubescente; elytris thorace non latioribus, parum elongatis; postice attenuatis, apice subtruncatis; infra corpore pro parte dense albo pubescente; pygidio elongato et acuminato, apice subtruncato, ad basin dense albo pubescente; pedibus posticis validis.

Long. 4 mm.

Par sa forme voisin de *M. nigricolor*, Pic, dont il se distingue facilement par la présence des bandes grises au prothorax, des macules blanches aux élytres et par ces organes un peu plus courts avec le pygidium plus étroit, à pubescence blanche soyeuse sur sa base.

Nyasaland: Cholo (*R. C. Wood*).

### *Synallecula costata*, sp. n.

Oblongo-elongata, antice et postice attenuata, subdepressa, paulo et diverse pubescens, nigra, supra opaca, infra corpore nitido, pro parte rufo, abdomine nigro, palpis, antennis ad basin pedibusque testaceis. Capite parum elongato, dense ruguloso-punctato, antice impresso, oculis valde distantibus; antennis elongatis, apice paulo crassioribus et brunnescentibus; thorace opaco, antice semicirculare, sat lato, sparse et minute punctato-perforato, punctis nitidis, postice sinuato, angulis posticis paulo

prominulis; scutello lato; elytris thorace parum distincte latioribus, humeris fere rectis, lateraliter vage subarcuatis, apice attenuatis, depressis, striato-punctatis, intervallis subcostatis, his minute punctatis et lineato pubescentibus; pedibus validis, femoribus crassis, tarsis sat crassis, pro parte appendiculatis.
Long. 3 mm.

Espèce très caractérisée, distincte entre toutes, soit par la particulière ponctuation du prothorax, soit par les élytres costés avec des rangées régulières de poils courts et jaunes sur les intervalles.

Sierra Leone: Soma, 25.xi.1925 (*E. Hargreaves*).

### *Zonitoschema testaceiventris*, sp. n.

Elongata, subnitida, parum griseo pubescens, testacea, antennis pro majore parte, pedibus pectoreque nigris. Capite testaceo, oculis, mandibulis apice palpisque nigris, illo elongato, late et fortiter punctato; antennis filiformibus nigris, articulis 7° et sequentibus ad basin diverse testaceis; thorace angustato et elongato, lateraliter subsinuato, antice valde attenuato, late sat sparse punctato, medio paulo impresso, illo testaceo, ad basin flavo marginato; scutello flavo-testaceo; elytris flavis, subopacis, minute et dense punctatis, elongatis; subparallelis, apice breve attenuatis; infra corpore medio nigro, abdomine testaceo; pedibus nigris, sat gracilibus.
Long. 15 mm.

Espèce voisine de *Z. eborina*, Fahr., et s'en distinguant, à première vue, par la coloration en partie foncée du dessous du corps, le premier article des antennes et les pattes foncées. Diffère, d'autre part, de *Z. nigrimembris*, Pic, dont les pattes sont foncées, par la coloration plus pâle du dessus, la tête et le prothorax plus allongés.

Southern Rhodesia: Bulawayo.

## BIBLIOGRAPHICAL NOTICE.

Ernst Huber. *Evolution of Facial Musculature and Facial Expression.* Pp. xii+184, 28 figs. Baltimore: The Johns Hopkins Press, 1931. Price 11*s.* 6*d.* net.

Professor Huber, of the Johns Hopkins University, has since 1913 carried out extensive investigations on the facial muscles, parts of which are briefly summed up in this little book, which is devoted mainly to the Primates. After a brief historic review, and a short general chapter, there are longer sections on the facial

musculature of the Primates, and of different human races, ending in a consideration of facial expression in Man. A full list of papers on the subject concludes the book.

The author's researches lead him to the conclusion that Mammals are diphyletic, the Monotremes and the Marsupial Placentals having originated independently from Theriodont Reptiles. As an alternative, it may be suggested that the facial musculature of the earliest Mammals may have been more generalized and more Reptilian in plan than Huber supposes. The Monotremes are not only warm-blooded hairy animals that suckle their young, but they have other features in common with the Marsupials and Placentals. The replacement of the quadrate-articular by the squamosal-dentary articulation, and the retention of the quadrate and articular bones for use as auditory ossicles, are not things likely to have happened twice.

In Primates the two primary layers of the superficial facial musculature are the *platysma*, a longitudinal layer that extends from the neck to the angle of the mouth, and beneath it the transverse *sphincter colli profundus*, which extends from the ear to the mouth. In Lemurs and lower Platyrrhines (*Aotus*, Hapalidæ) these layers are little differentiated, but in other Primates they may give rise to a number of independent muscles. The reviewer, who has studied the evolution of the Primates from another standpoint (Ann. & Mag. Nat. Hist. (10) vi. 1930, p. 383), finds Huber's treatment of his subject full of interest. The facial musculature of *Tarsius* is highly specialized on the primitive prosimian ground-plan; these specializations are unique in *Tarsius*. *Aotus* combines primitive characters of the Prosimiæ and Hapalidæ. Definite evolutionary trends can be recognized in the ascending scale of the Platyrrhines, and parallel to it in the ascending scale of the Catarrhines. The plan of facial musculature of the Orang shows striking deviations from the ground-plan common to the Gorilla, Chimpanzee, and Man.

In these and other respects the evolution of the facial musculature parallels that of the skeleton, and tells the same story of relationships. The diversity of the Cebidæ, which has led Pocock to divide them into a number of subfamilies, extends to the facial musculature, and in this, as in skeletal structure, *Aotus*, the most primitive Platyrrhine, is much closer to the Hapalidæ than to the the more specialized genera of the Cebidæ. The classification of the Platyrrhines would perhaps be better balanced if the Marmosets were given only subfamily rank, in which case the Hapalinæ would fall naturally into place between the Aotinæ and Callicebinæ.

The facial muscles of several different races of Man are described and compared. In Negroes the facial muscles are more strongly developed, and the individual muscles less differentiated, than in the Whites. Other races examined more or less resemble the Negroes in this respect, but have their individual peculiarities. These structural differences influence facial expression, fine modulations requiring a responsive neuro-mechanism, well-differentiated mimetic muscles, and a thin skin; but other things must be considered, *e.g.*, language and education. "Through conservative, rather rigid education facial expression in the Chinese and Japanese is apparently suppressed."

To sum up, this book contains for the student of muscles, or of Anthropology, an informative summary, with full references to more detailed accounts, and anyone interested in the evolution and classification of the Primates will find in it additional evidence presented in a convenient and readable manner. C. T. R.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

March 18th, 1931.—Prof. E. J. Garwood, M.A., Sc.D., F.R.S., President, in the Chair.

The following communications were read:—

1. 'On the Septal Development and the Genotype of the Coral Genus *Petraia* Münster.' By Prof. Otto H. Schindewolf, Ph.D.

There is no coral genus which has been so persistently misinterpreted as *Petraia*. It was founded by Münster in 1839 upon small simple corals from the *Orthoceratites*-limestone of Elbersreuth and the *Clymenia*-limestone of Schubelhammer in the Frankenwald (Bavaria), on the supposition that they were gastropods.

The confusion is partly due to Münster's very meagre description and inadequate figures, but also to the fact that he, and all later writers who have described these Bavarian corals, failed to discriminate between the Elbersreuth and Schubelhammer limestones, which, as the Author has previously shown, are of different ages. The former is Upper Silurian (Upper Ludlow), and the latter Upper Devonian. The corals were, therefore, considered to be of the same age, and to be congeneric, and even conspecific. The diagnoses of *Petraia* are thus framed upon mixed Silurian and Devonian forms, or upon Upper Devonian corals alone, since the latter are much more common.

The Author, by showing that the genotype of *Petraia* is a synonym of *Petraia radiata* Münster, restricts the name to the Upper Silurian species. The Devonian species belong to Počta's genus *Alleynia*.

*Petraia*, which is well characterized by its conical shape, deep calice, external ornamentation, arrangement of the septa and, in normal specimens, by the absence of transverse tissue, has not been found outside Bavaria. Nevertheless, the name has been applied to genera belonging to various lineages ranging from Ordovician to Permian, and occurring in various parts of the world. A detailed account is here given of the septal development in *Petraia* compared with certain other corals.

The misinterpretation of *Petraia* is particularly unfortunate, since the name is continually used in systematic and phylogenetic literature.

2. 'A Fossiliferous Limestone associated with Ingletonian Beds at Horton-in-Ribblesdale, Yorkshire.' By William Bernard Robinson King, O.B.E., M.A., F.G.S.

The paper deals with an exposure of green felspathic grits with associated calcareous rocks in the railway cutting south of Horton-in-Ribblesdale station. The grits have always been referred to the 'Green slate' or Ingletonian series. The limestone has been known since the Geological Survey Memoir was published in 1890, and has hitherto been considered part of the Ingletonian series.

In 1921, fossils were discovered in the limestone, and recently a large fauna has been obtained which proves to be of Ashgillian age, and closely comparable with the fauna of the Keisley Limestone of Edenside. If the limestone is interbedded, as appears at first sight, the discovery means that a considerable thickness of the Ingletonian grits are of late Ordovician age. The problems of general stratigraphy that this contention raises are discussed, and it is considered that there is much evidence of a general nature to suggest that, although the limestone is undoubtedly of Ashgillian age, the grits with which it is associated must be considerably older.

Calcareous matter occurs in two forms in the cutting; first, as the infilling between the grit blocks of a breccia, and secondly, as a crystalline fossiliferous limestone apparently interbedded with the grits.

A detailed study of the limestone, however, shows that it is essentially of the same origin as the calcareous part of the breccia, since it contains angular fragments of grit and occasional flakes of roughly-cleaved green mudstone of a type exactly like the Ingletonian of the neighbourhood. The fossils show no signs of distortion by cleavage.

It is suggested that this is another case of a 'Neptunian dyke'. The fissure probably originated in Ashgillian times as the result of an earthquake shock, which caused the hard and steeply-inclined grits forming the sea-floor to gape along their bedding planes. As a result, the soft, unconsolidated calcareous mud of Ashgillian age was engulfed into the fissure, where it has hardened to the limestone.

The accumulated evidence points to the Ingletonian of Horton being almost certainly of Pre-Cambrian age.

THE ANNALS

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[TENTH SERIES.]

No. 48. DECEMBER 1931.

# LXXIX.—*Some Fresh-water Entomostraca of the Birmingham District.* By A. G. Lowndes, M.A., F.L.S.

## Introduction.

To the minds of many people the mention of the word Birmingham merely calls up some fictitious vision of a part of the Black Country, but those who know the district will have a very different impression.

The city itself, to my mind one of the finest in the world, with its population of a million or more people, stands right at the centre of one of the most delightful districts in the British Isles, for it seems to combine in an almost unique way all the amenities of a large town and beautiful country.

During the last three years I have been able to spend a part of the Summer and Easter vacations at the Zoological Laboratory of the University at Edgbaston, and my time has been largely devoted to collecting and identifying fresh-water Entomostraca.

My most sincere thanks are due to the Professor of Zoology and other members of the teaching staff for the opportunity afforded of working under the most pleasant conditions.

It would be almost impossible to give anything like a full description of the collecting-grounds, nor is it claimed that anything approaching a full survey has been made. Actually during the three years I have spent less than six months altogether at Birmingham, and these have of necessity been at special times. For most purposes the Easter vacation is too early to collect summer species, while the Summer vacation is too late. In spite of this, however, I have been able to collect almost exactly 100 different species of fresh-water Entomostraca.

Of these species one is new to Science and also of considerable scientific interest, while two other species are recorded in this country for the first time.

## LIST OF SPECIES.

### COPEPODS (33 species).

PARASITIC:

*Argulus foliaceus*, Linnæus.

FREE-SWIMMING:

#### Calanoids.

*Diaptomus gracilis*, Sars.
*Eurytemora velox*, Lilljeborg.

#### Cyclopidæ.

*Cyclops strenuus*, Fischer.
—— *vicinus*, Uljanin.
—— *vulgaris*, Koch.
—— *americanus*, Marsh.
—— *lucidulus*, Koch.
—— *pulchellus*, Koch.
—— *bisetosus*, Rehberg.
—— *languidus*, Sars.
—— *nanus*, Sars.
*Mesocyclops obsoletus*, Koch.
*Pachycyclops signatus*, Koch.
—— *bistriatus*, Koch.
*Pachycyclops annulicornis*, Koch.
*Leptocyclops agilis*, Koch.
—— *speratus*, Lilljeborg.
—— *lilljeborgi*, Sars.
—— *macruroides*, Lilljeborg.
*Platycyclops phaleratus*, Koch.
—— *affinis*, Sars.
—— *fimbriatus*, Fischer.
—— *poppei*, Rehberg.
*Cryptocyclops bicolor*, Sars.
—— *rubellus*, Lilljeborg.

#### Harpacticids.

*Canthocamptus staphylinus*, Jurine.
—— *minutus*, Claus.
*Attheyella crassa*, Sars.
*Attheyella pygmæa*, Sars.
—— *zschokkei*, Schmeil.
*Moraria arboricola*, Scourfield.
*Phyllognathopus viguieri*, Maupas.

CLADOCERA (38 species).

*Sida crystallina*, O. F. Müller.
*Daphnia pulex*, De Geer.
—— *longispina*, O. F. Müller.
—— *hyalina*, Leydig.
—— *hyalina*, var. *galeata*, Sars.
*Scapholeberis mucronata*, O. F. Müller.
–, var. *cornuta* Auctor.
*Simocephalus vetulus*, O. F. Müller.
—— *exspinosus*, Koch.
*Ceriodaphnia reticulata*, Jurine.
—— *megalops*, Sars.
—— *quadrangula*, O. F. Müller.
—— *pulchella*, Sars.
—— *laticaudata*, O. F. Müller.
*Bosminia longirostris*, O. F. Müller.
—— *obtusirostris*, Sars.
*Ilyocryptus sordidus*, Liévin.
—— *agilis*, Kurz.
*Macrothrix hirsuticornis*, Norman & Brady.
*Eurycercus lamellatus*, O. F. Müller.
*Camptocercus rectorostris*, Schoedler.
*Acroperus harpæ*, Baird.
*Alona quadrangularis*, O. F. Müller.
—— *affinis*, Leydig.
—— *costata*, Sars.
—— *guttata*, Sars.
—— *rectangula*, Sars.
*Leydigia quadrangularis*, Leydig.
*Graptoleberis testudinaria*, Fischer.
*Alonella nana*, Baird.
*Perutacantha truncata*, O. F. Müller.
*Pleuroxus trigonellus*, O. F. Müller.
—— *uncinatus*, Baird.
—— *aduncus*, Jurine.
*Chydorus globosus*, Baird.
—— *ovalis*, Kurz.
—— *sphæricus*, O. F. Müller.
*Leptodora kindtii*, Focke.

OSTRACODS (28 species).

*Candona candida*, O. F. Müller.
*neglecta*, Sars.
—— *sarsi*, Hartwig.
—— *fabæformis*, Fischer.
—— *rostrata*, Brady & Norman.
—— *albicans*, Brady.
*Cryptocandona vàvrai*, Kaufmann.
*Candonopsis kingsleyi*, Brady & Robertson.
*Cyclocypris globosa*, Sars.
—— *ovum*, Jurine.
—— *lævis*, O. F. Müller.
*Cypria exculpta*, Fischer.
—— *ophthalmica*, Jurine.
*Notodromas monachus*, O. F. Müller.
*Ilyocypris biplicata*, Koch.
*Ilyocypris gibba*, Ramdohr.
—— *ambigua*, sp. n.
*Cypricercus fuscatus*, Jurine.
—— *obliquus*, Brady.
*Heterocypris incongruens*, Ramdohr.
*Herpetocypris reptans*, Baird.
—— *intermedia*, Kaufmann.
*Prionocypris olivacea*, Brady & Norman.
*Prionocypris vidua*, O. F. Müller.
*Cypridopsella villosa*, Jurine.
*Darwinula stevensoni*, Brady & Robertson.
*Limnicythere inopinata*, Baird.
*Scottia browniana*, Jones.

The list then comprises just 99 species—Copepods 33, Cladocera 38, and Ostracods 28, and a few remarks are necessary on each group.

COPEPODS.

*Argulus foliaceus* is quite common during August and September. I found it in great numbers in the Edgbaston

Reservoir, either swimming freely or attached to the small fish. The fish, chiefly sticklebacks, do not seem to suffer a great deal from the parasite. I have kept a few of these fish with *Argulus* on them, and they have remained apparently perfectly healthy in an aquarium for four months. One specimen had three of the parasites attached for the greater part of the time.

*Eurytemora velox* is a well-known Calanoid which occurs in fresh and brackish water. On one occasion I found it in large numbers together with *Diaptomus gracilis* in the Edgbaston Reservoir.

*Cyclops strenuus*, which was found during August and September, is of interest. In the South of England, and also in Wilts and counties adjacent, the species usually disappears during the summer but is abundant during the winter. In the north of England, in Scotland, and the Highlands it is found all the year round.

Both *Leptocyclops sperutus* and *L. lilljeborgi* are interesting species. At one time it was very doubtful if specific rank could be given to them. I was able to obtain living specimens of each species and take them back to Marlborough, where a number of breeding experiments were carried out, and I think the question was finally settled.

*Phyllognathopus viguieri* is a most remarkable species. It is to be found at any time by taking some of the liquid enclosed by the leaves of the Bromeliaceous plants (pineapples) from the Botanic Gardens. This seems to be its natural habitat, and is almost the only kind of place where it is to be found in this country. Mr. Scourfield obtained it from precisely similar situations at Kew Gardens, and recorded it in 1903, but apart from this there is no other record.

Lately I have obtained numerous specimens by taking ordinary fresh pineapples bought from any fruit store and setting them in pots of earth with the leaves above the surface. The pots are watered daily, and a few weeks afterwards the animals are found swimming freely in the spaces between the stem and leaves.

## CLADOCERA.

Among the Cladocera *Leptodora kindtii* is by far the most interesting species. It occurs very abundantly during

August and September in the large reservoir at Alvechurch and also at Earlswood Reservoir. It is by far the largest Cladoceran found in British waters and is of considerable scientific interest, since at one period of its life-history it gives rise to nauplius larvæ which are otherwise unknown among the Cladocera.

It occurs fairly abundantly in the Lake District and in Scotland, and has been recorded from the Regent's Canal, Regent's Park, London.

An unsuccessful attempt was made during the year to obtain the nauplii. A visit was made to Alvechurch Reservoir in May and a plentiful supply of mud was taken back to Marlborough. This was covered with water and left for some months, but no Leptodora, either young or old, were obtained from it either in August or September, while the proper reservoir contained abundant specimens. Plenty of other Entomostraca were obtained from the same mud. The point is rather an interesting one, for at the time of gathering the mud there were no Leptodoras in the water of the reservoir, and, as a great number have appeared there since, it is pretty certain that the animals were hatched out later from resting eggs contained in the mud, but presumably under the artificial conditions these eggs were incapable of hatching.

## OSTRACODS.

Among the Ostracods there are several interesting records including the following :—

### *Candona neglecta*, G. O. Sars.

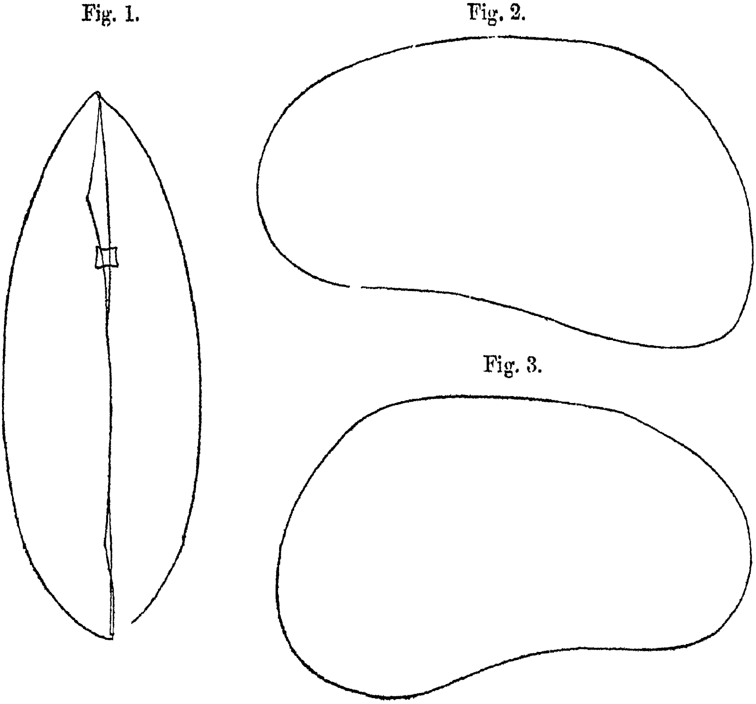
*Female.*—Length 1·2 mm., height ·63 mm., width ·50 mm. The greatest height barely exceeds half the length, and its position lies far back.

The dorsal margin is nearly straight, though oblique. Towards the posterior end it forms a distinct angle. The ventral margin is sinuate.

Seen dorsally the left valve definitely overlaps the right at both ends, though the valves are not conspicuously unequal. Both ends are rounded and pointed or angular, while the posterior end is only slightly blunter than the anterior. The position of maximum width lies at the mid-point, and it is distinctly less than half the length.

*Integument.*—Seen under the low power it is coarsely reticulate, and appears minutely sculptured under high powers. It is sparsely covered with hairs.

The ventral margin of both valves is conspicuously thickened. The inner duplicatures are rather broad in front. The dorsal suture of the two valves is somewhat sinuate. The genital lobes are broadly rounded and not angulated behind. The second foot is somewhat stout with the penultimate joint distinctly subdivided. All three setæ of the terminal joint are well developed, the shortest being nearly as long as the divided penultimate joint. The caudal rami are conspicuously bent. The dorsal seta is situated some distance from the end of the rami and is longer than the shorter claw. The claws are not smooth, but are finely toothed.



*Candona neglecta*, G. O. Sars.

Fig. 1.—Female seen dorsally.
Fig. 2.—Female seen laterally.
Fig. 3.—Male seen laterally.

*Male.*—Length 1·16 mm., height ·64 mm.

The shape of the shell differs from that of the female. sinuate while the posterior

Fig. 4.

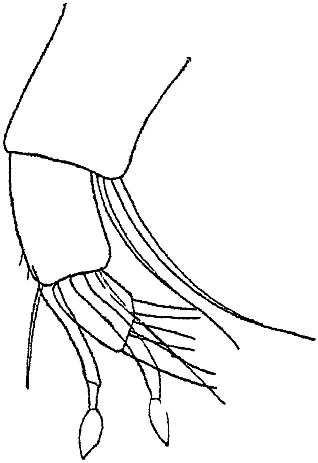


Fig. 6.

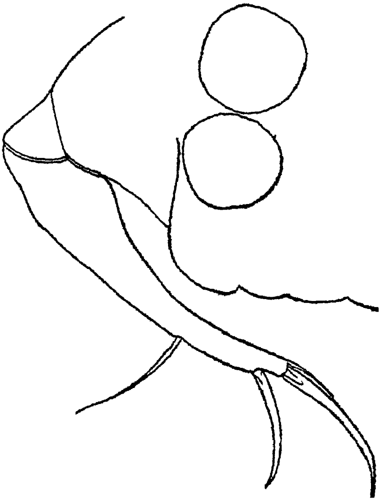
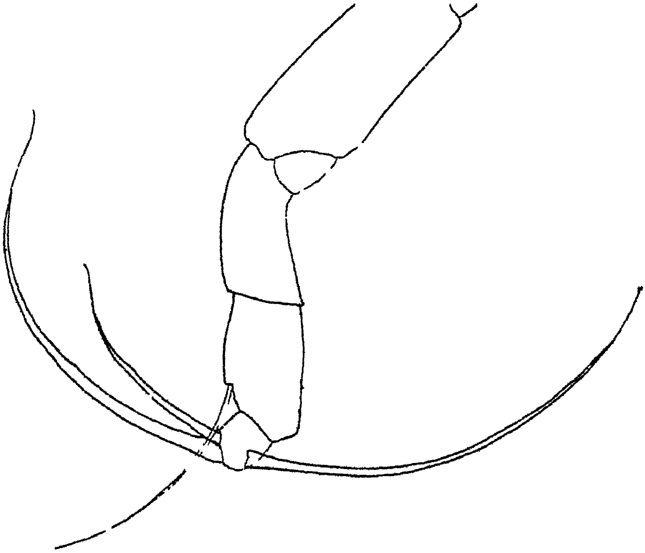


Fig. 5.



*Candona neglecta*, G. O. Sars.

Fig. 4.—Last two joints of the second antenna of male.
Fig. 5.—Last three joints of second foot.
Fig. 6.—Female. Caudal rami and genital lobe.

end is distinctly more angular. The caudal rami are practically straight. The most distinctive characteristic is, however, the peculiar form of the sensory setæ on the penultimate joint of the posterior antennæ. These are shown in the figure (fig. 4), and appear to be quite unlike those of any other species of *Candona*.

The prehensile palps of the maxillipeds are conspicuously dissimilar, and are identical with those figured by Sars (1928). The copulative appendages are also identical.

*Remarks.*—The form described above is not quite identical with that described by Sars. The size is considerably less in both sexes. The claws of the caudal rami are different, and so are the genital lobes in the female. There are also other slight differences. Males appear to be scarce, and it was not until I had dissected these carefully that I was certain that I was right in describing the species as *Candona neglecta*.

Fig. 7.

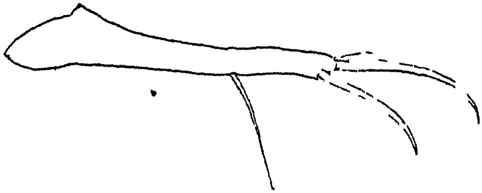


Fig. 8

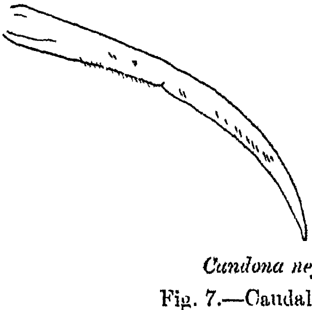
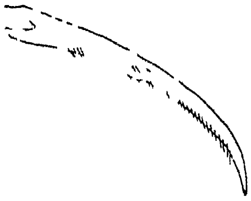


Fig. 9.



*Candona neglecta*, G. O. Sars.

Fig. 7.—Caudal rami. Male.
Fig. 8.—Longer claw of caudal rami.
Fig. 9.—Shorter claw of caudal rami.

The males, however, appear to put the matter beyond any doubt, especially when the second antennæ are observed. Strangely enough, this characteristic seems to have escaped the notice of all except Kaufmann (1900), who also figures the claws of the caudal rami with minute denticles etc.

The species has been recorded by Brady (1910), but it seems to have escaped the notice of all other British systematists, and, in fact, Brady himself seems to have failed to have noticed it till its occurrence in one of his figures was pointed out by Hartwig (1901). On the Continent the species seems to be pretty well known.

Several specimens of both sexes occurred in the mud at the bottom of Harborne Reservoir.

*Cryptocandona vàvrai*, Kaufmann, is a new record for the British Isles. A large number of specimens were obtained from near Keeper's Pool, Sutton Park.

Previously the species had been recorded from Sweden, Norway, and Switzerland.

*Ilyocypris ambigua* is a species new to Science. Its description is as follows :—

### *Ilyocypris ambigua*, sp. n.

*Female.*—In external appearance the animal is identical with *Ilyocypris gibba* (Ramdohr), as figured by Sars in 'Crustacea of Norway,' vol. ix., except for the following points. The small tubercles round the edge of the valves are more pronounced, and in this respect the animal is identical with *Ilyocypris gibba*, Ramdohr, as figured by Müller (1900), pl. xix. fig. 7. Seen dorsally the animal is less gibbous, while the anterior end is more rounded and less pointed.

The characteristic projections are identical.

The structure of the shell is identical otherwise, including the inner duplicatures.

The limbs are identical, with the exception of the anterior legs, in which the penultimate joint is distinctly subdivided.

Length ·8 to ·9 mm.

*Male.*—These are just as common as the females. Moreover, practically all the females dissected showed evidence of copulation by the presence of large masses of sperms and occasionally ejaculatory tubes.

Seen dorsally the appearance was identical with that of the female, except that the width was a little less in proportion.

On dissecting and examining the various limbs and copulatory processes, etc., it was found that they were identical with those figured by Sars for *Ilyocypris biplicata*, Koch.

Length ·8 to ·85 mm.

Dimensions of one adult female (exclusive of protuberances):—

Length ·88 mm., height ·50 mm., width ·33 mm.

Dimensions of one adult male:—

Length ·82 mm., height ·46 mm., width ·28 mm.

*Occurrence.*—A large number of specimens of both sexes were found in the mud from the bottom of Harborne Reservoir. In the majority of cases the animals were covered over with a brown coating of mud. Notwithstanding the great length of the setæ on both pairs of antennæ, the animals are incapable of self-support in the water, though they were able to move rapidly over the surface of the mud.

*Remarks.*—The occurrence of this peculiar form is of considerable interest. Except for the structure of the first leg, I should have had no hesitation in referring the specimens to *Ilyocypris gibba*, Ramdohr. True, there are some slight differences of dimension, and also the frequent occurrence of the males.

Again, were it not for the occurrence of the well-known protuberances as well as the first foot, I should have had no hesitation in referring the species to *Ilyocypris biplicata*, Koch. The occurrence of the males and their structure strongly supports this view, and systematists are by no means agreed about the separation of these two species.

The structure of the first foot suggests that the species should be referred to Daday's genus *Iliocyprella*, but the swimming-setæ of both antennæ make this impossible. Sars recognises the two genera *Ilyocypris*, Brady & Norman, and *Iliocyprella*, Daday, and gives as the chief criteria the well-developed, *versus* rudimentary, setæ of the second antennæ and the undivided, *versus* subdivided, penultimate joint of the first foot.

The occurrence of *Ilyocypris ambigua* quite definitely rules out one of these criteria, and one is left with the setæ of the second antennæ alone. This seems to me to be altogether insufficient for the separation of these two genera, especially as a transitional stage is found in *Ilyocypris iners*, Kaufmann, and also in *Ilyocypris decipiens*, Masi.

One has, therefore, no further hesitation in uniting the two genera under the one name *Ilyocypris*, Brady & Robertson.

But having used this species to unite two genera, it is necessary to try and place that species in some definite place within that genus.

The species closely resembles *Ilyocypris decipiens*, Masi (1906). It differs, however, from that species in the length of the setæ on the second antennæ. In *I. ambigua* these reach far beyond the tips of the claws—in fact, the tips of the claws occur about the mid-point of the setæ, while in *I. decipiens* they reach to the tips of the claws only. Again, if the protuberances mean anything they form another distinction.

To sum up, *Ilyocypris* combines the characteristics of being a very sharply defined genus and yet a very variable one. There is no difficulty in referring any particular species to that genus, but within the genus the species themselves show some most remarkable gradations.

The form described above is on this occasion given specific rank tentatively. It cannot be referred to any known species, and yet it appears as a transitional stage between several. Some systematists would see in this sufficient reason for uniting the several species in question under the one name. I had seriously thought of this, but at present the step seems to be too drastic.

There are a number of living specimens isolated and under culture at Marlborough. These may or may not give some indication of the correct treatment of the genus, but at present it is thought wiser to retain the several species separately but to place them under the one genus.

*Herpetocypris intermedia*, Kaufmann, is also a new record for the British Isles. Previously it had been recorded from Switzerland only. The species has been fully described and figured in the Marlborough College Natural History Report (Lowndes, 1930).

Numerous specimens are to be obtained from the mud near Keeper's Pool, Sutton Park. The species, though belonging to the genus *Herpetocypris*, bears quite long setæ on its second antennæ. The setæ on the second antennæ have usually been associated with swimming. *H. intermedia* has been observed in the elutriator recently (an instrument used for investigating the swimming powers of Entomostraca), and it is quite devoid of any swimming powers.

*Scottia browniana*, Jones, is a rare species. It has been fully described and figured in the Marlborough College Natural History Report (Lowndes, 1930). Living specimens were recorded by Thomas Scott in 1889 from Loch Fadd in the Isle of Bute.

## GENERAL REMARKS.

The number of species is not large, but a full survey is not claimed in any way, and as I mentioned previously the time of collecting was very limited.

There are several well-known species unrecorded, including many of the larger Ostracods.

The actual collecting-stations may be roughly grouped into three—namely, those close to the University and within a very few miles of the City Centre, Sutton Park, and Alvechurch.

A considerable proportion of the time was spent in collecting at Sutton Park, but later investigation showed that the time might have been spent just as profitably at Harborne Reservoir. One or two of the collecting-stations will be described, with a list of the species obtained.

## HARBORNE RESERVOIR.

This is an open stretch of water nearly half a mile long and about half that width in the wider part. The line of greatest length lies almost due east and west. The east end is the deeper and it is from this end that the Bourn Brook starts. The west end is quite shallow and silted up. The greatest depth is about thirty feet.

Round the edge there are several trees and many of these are overhanging, while in places there are large patches of grass, *Arundo Phragmites*.

Towards the shallower end there is a large patch of rushes, *Scirpus lacustris*, and beyond this a much larger bed consisting almost entirely of *Equisetum* sp. Towards the south side of the shallower end there is a large bed of *Polygonum amphibium*.

Boats are obtainable, and it is fairly easy to investigate this piece of water. I make no claim to have investigated this reservoir thoroughly, but I took samples from the following:—

(1) The open water at the deep end.
(2) The mud lying at the bottom of this deeper water.
(3) The *Scirpus* bed.
(4) The *Equisetum* bed.
(5) The *Polygonum* bed.

All these collections were made during the first half of September 1931, when the *p*H of the open water was found to be 7·2. Three visits in all were made to this reservoir.

## SPECIES IDENTIFIED.

### *Open water.*

| COPEPODS. | CLADOCERA. | OSTRACODS. |
|---|---|---|
| *Diaptomus gracilis.* | *Daphnia longispina.* | None. |
| *Cyclops strenuus.* | *Pleuroxus aduncus.* | |
| *Mesocyclops obsoletus.* | *Bosminia longirostris.* | |
| *Argulus foliaceus.* | | |

Only two species were really abundant, and these were *Diaptomus gracilis* and *Daphnia longispina.* The occurrence of *Cyclops strenuus* at this time of year is rather unusual (see general remarks on the species).

### *Mud under open water.*

| COPEPODS. | CLADOCERA. | OSTRACODS. |
|---|---|---|
| *Platycyclops fimbriatus.* | *Pleuroxus uncinatus.* | *Ilyocypris ambigua.* |
| | *Ilyocryptus agilis.* | *Cypria ophthalmica.* |
| | | *Candona neglecta.* |
| | | *Darwinula stevensoni.* |

The mud consists of a very fine silt and requires careful washing before these species can be obtained from it.

### Scirpus *bed.*

| COPEPODS. | CLADOCERA. | OSTRACODS. |
|---|---|---|
| *Diaptomus gracilis.* | *Daphnia longispina.* | *Pionocypris vidua.* |
| *Cyclops vulgaris.* | *Simocephalus vetulus.* | *Cypria ophthalmica.* |
| *Mesocyclops obsoletus.* | *Scapholeberis mucronata,* var. *cornuta.* | *Cyclocypris lævis.* |
| *Leptocyclops agilis.* | *Ceriodaphnia reticulata.* | *Candona neglecta.* |
| —— *speratus.* | —— *quadrangulata.* | |
| *Pachycyclops annulicornis.* | —— *pulchella.* | |
| *Platycyclops affinis.* | *Leydigia quadrangularis.* | |
| | *Camptocercus rectirostris.* | |
| | *Chydorus sphæricus.* | |

### Equisetum *beds.*

| COPEPODS. | CLADOCERA. | OSTRACODS. |
|---|---|---|
| *Diaptomus gracilis.* | *Daphnia longispina.* | *Cyclocypris lævis.* |
| *Cyclops vulgaris.* | *Simocepalus vetulus.* | *Pionocypris vidua.* |
| —— *strenuus.* | *Scapholeberis mucronata,* var. *cornuta.* | |
| *Mesocyclops obsoletus.* | *Ceriodaphnia reticulata.* | |
| *Pachycylops annulicornis.* | —— *quadrangulata.* | |
| *Canthocamptus staphylinus.* | *Pleuroxus truncatus.* | |
| | *Alona quadrangulata.* | |
| | *Chydorus sphæricus.* | |

The surface of the water at the time of collecting abounded with *Scapholeberis mucronata*, var. *cornuta*, and the ephippia of *Daphnia longispina.*

COPEPODS.

*Diaptomus gracilis.*
*Cyclops vulgaris.*
*Mesocyclops obsoletus.*
*Leptocyclops speratus.*
—— *agilis.*
*Canthocamptus staphylinus.*

CLADOCERA.

*Daphnia longispina.*
*Simocephalus vetulus.*
*Scapholeberis mucronata*, var. *cornuta.*
*Pleuroxus aduncus.*
*Graptoleberis testudinaria.*
*Camptocercus rectirostris.*
*Chydorus sphaericus.*
—— *globosus.*

OSTRACODS.

*Cyclocypris laevis.*
*Pionocypris vidua.*
*Cypria ophthalmica.*

As a result of three visits, twenty-six species of Entomostraca were obtained. It will be noted that the number of Ostracods is very small, but this is easily explained by the fact that little attempt was made to look for these somewhat elusive Entomostraca systematically.

If the grass round the sides of the reservoir and the roots of trees and small holes in the mud were searched, it is quite certain that the number would be doubled. Again, many of the free-swimming Ostracoda—e. g., *Cypricercus* and *Cypris*—are much more abundant during spring or early summer.

As it is, however, the occurrence of the particular species *Ilyocypris ambigua* found is of considerable interest, since it would appear that the occurrence of this form, which is apparently new to Science, makes the amalgamation of two genera and perhaps some half-dozen species into one genus and one species advisable.

*Ilyocryptus agilis*, Kurz, is also considered a rare species.

## *Edgbaston Pool.*

This is a large pool nearly half a mile long and about twice as long as it is broad. Vegetation is abundant both in the pool and around its bank. At places the water is considerably overhung by trees. The water is not deep and the muddy bottom is covered with vegetation, including algæ.

The most remarkable feature about this pool is the paucity of Entomostraca. On casting a small tow-net one would normally expect it to be filled with animals, instead of which one only finds two or three.

On the one occasion when I visited the pool, I collected for about an hour and a half and investigated both the open water and that overhung by trees.

The following is a list of species obtained :—

COPEPODS.

*Diaptomus gracilis.*
*Cyclops vulgaris.*
—— *americanus.*
*Leptocyclops agilis.*
*Pachycyclops annulicornis.*
*Platycyclops fimbriatus.*

CLADOCERA.

*Simocephalus vetulus.*
*Alona costata.*
*Leydigia quadrangularis.*
*Chydorus sphæricus.*

OSTRACODS.

*Candona candida.*
*Cypria ophthalmica.*
*Cyclocypris lævis.*
*Ilyocypris gibba.*

Small fish were abundant, together with *Limnea stagnalis* and *Sphærium corneum.* Two specimens of *Asellus* were found, but no specimen of *Gammarus* was seen.

### *Sutton Park, Longmoor Pool.*

From the pool itself nothing very interesting was taken, but towards the shallower end there are some good marshes composed chiefly of *Sphagnum* sp. and *Equisetum* sp.

In the pool itself the chief Entomostraca were *Sida crystallina* and *Cyclops lucidulus*, while in the mud at the bottom there were plenty of specimens of *Ilyocypris gibba.*

*From the* Sphagnum *the following species were obtained* :—

*Cyclops bisetosus.*
—— *nanus.*
*Pachycyclops phaleratus.*
—— *poppei.*
*Cryptocyclops rubellus.*
*Attheyella crassa.*
—— *pygmæa.*
*Cypria ophthalmica.*
*Candona fabæformis.*
*Alona quadrangularis.*

*From the* Equisetum *beds the following were obtained* :—

*Cyclops languidus.*
—— *nanus.*
*Simocephalus expinosus.*

*From the Marsh, south-west of the pool, the following were obtained* :—

*Cyclops vulgaris.*
—— *lucidulus.*
—— *languidus.*
—— *bisetosus.*
*Leptocyclops agilis.*
*Pachycyclops affinis.*
*Canthocamptus minutus.*
*Attheyella crassa.*
*Alona costata.*
—— *guttata.*
*Candona candida.*
—— *albicans.*
*Herpetocypris reptans.*
—— *intermedia.*
*Cypridosella villosa.*
*Chydorus sphæricus.*

### *Keeper's Pool, Sutton Park* :—

*From squeezings of* Sphagnum.

*Cyclops bisetosus.*
—— *lucidulus.*
*Leptocyclops agilis.*
*Attheyella pygmæa.*
*Chydorus sphæricus.*
*Alona affinis.*

*Candona candida.*
*Prionocypris olivacea.*
*Cyclocypris globosus.*
—— *lævis.*
*Cypria ophthalmica.*
*Cypridosella villosa.*

### *Mud near the shallow end of Keeper's Pool* :—

*Cryptocandona vàvrai.*
*Candonopsis kingsleyi.*
*Herpetocypris intermedia.*
*Prionocypris olivacea.*

*Cypridopsella villosa.*
*Darwinula stevensoni.*
*Scottia browniana.*

### *Bracebridge Pool, Sutton Park.* Among *Skirpus lacus-*

*Leptocyclops lilljeborgi.*
—— *speratus.*
*Mesocyclops obsoletus.*
*Pachycyclops bistriatus.*

*Cryptocyclops bicolor.*
*Alona costata.*
*Alonella nana.*

### *In the open water* :—

*Diaptomus gracilis.*
*Cyclops vicinus.*
*Daphnia hyalina.*
—— *longispina.*
*Chydorus sphæricus.*

*Bosminia longirostris.*
*Ceriodaphnia reticulata.*
*Camptocercus rectirostris.*
*Graptoleberis testudinaria.*

### *Earlswood Reservoir* :—

*Diaptomus gracilis.*
*Cyclops lucidulus.*

*Daphnia hyalina*, var. *galeata.*
*Leptodora kindtii.*

### *Alvechurch Reservoir.* Open water, *p*H 8·4 :—

*Diaptomus gracilis.*
*Cyclops vicinus.*
—— *vulgaris.*
—— *americanus.*
*Pachycyclops annulicornis.*
*Leptocyclops agilis.*
*Mesocyclops obsoletus.*

*Daphnia longispina.*
—— *hyalina.*
*Ceriodaphnia reticulata.*
*Alona quadrangularis.*
—— *affinis.*
*Bosminia obtusirostris.*
*Leptodora kindtii.*

### *Edgbaston Reservoir.* Open water, *p*H 8·4.

*Argulus foliaceus* (very abundant).
*Diaptomus gracilis.*
*Eurytemora velox.*
*Cyclops vicinus.*
*Leptocyclops agilis.*

*Pachycyclops affinis.*
—— *fimbriatus.*
*Bosminia obtusirostris.*
*Chydorus sphæricus.*
*Cypria ophthalmica.*
*Cyclocypris lævis.*

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## LXXX.—*On Two little-known Species of the Genus* Scolitantides, *Hb.* (*Lep.*, Lycænidæ). By Captain A. F. HEMMING, C.B.E.

THE genus *Scolitantides*, Hb. (1822–23), was erected for two species, viz., *battus*, Schiff. [=*orion*, Pall.], and *hylas*, Schiff. [=*vicrama*, Moore]. The type was subsequently fixed by Tutt (1906, Ent. Record, xviii. p. 131) as *orion*, Pall. For a discussion of the type-fixation of this genus, see Hemming, Ann. & Mag. Nat. Hist. 1929, ser. 10, iii. p. 240.

The following notes on two species hitherto assigned to the composite genus *Lycæna*, F. (1807), and now for the first time placed in the genus *Scolitantides*, were made in the course of work on this part of the British Museum Collection.

### *Scolitantides divina*, Fixs.

There has been a great deal of confusion in regard to this species, the variation and synonymy of which may be summarized as follows :—

#### (a) *Scolitantides divina divina*, Fixs.

*Lycæna divina*, Fixsen, 1887, in Romanoff, Mém. Lépid. iii. p. 286, pl. xiii. figs. 5 A, B, ♀, "Korea."
*Lycæna divina*, Fixs., Oberthur, Et. Lépid. Comp. xiii. p. 45, pl. 434. fig. 3744, ♂.
*Lycæna heijonis*, 1929, Matsumura, Ins. Mats. iii. (4), p. 141, "Korea."

Matsumura (1929) has recently redescribed this subspecies as *Lycæna heijonis* from a single ♀ taken in July 1920 at Heijo, in Korea, by H. Okamoto.

This subspecies appears to be scarce. The British Museum possesses only 3 ♂ ♂. The first is labelled "Corea, Pungking, *Herz*, *ex Christoph. coll.*"; the second, *ex Elwes coll.*, also taken by Herz, is simply labelled "Corea," and the third, *ex Oberthur coll.*, is labelled "Corée, Séoul."

### (b) *Scolitantides divina barine*, Leech.

*Lycæna barine*, Leach, 1893, Butt. China, (2) p. 304, pl. xxxi. fig. 4, ♂ ["♀"].

*Lycæna iburiensis*, Butl., Pryer, *nec* Butl., 1888, Rhop. Nihon, p. 19, pl. v. fig. 5, ♂.

The insect described by Leech as *Lycæna barine* has been the subject of a great deal of misapprehension, in spite of the excellent figure that accompanied the original description. The type is in the British Museum, and is obviously referable to *Scolotantides divina*, Fixs., of which it is the Japanese subspecies. As no comparative description of *barine* has ever been published, the following short diagnosis is given:—

*Upperside*. *Fore wing*: discoidal spot almost invisible (well marked in *d. divina*); fore wing black marginal border narrow and partially broken, constituent spots show more clearly in interspaces 1 B, 2, 3, 4 (border solid and broader in *d. divina*). *Hind wing*: no submedian spots on disc (present in 2 (of 3) specimens of *d. divina*).

*Underside*. *Fore wing*: antimarginal and submedian spots smaller, upper basal spot single and small (double in *d. divina*), lower basal spot faintly indicated. *Hind wing*: orange submarginal band narrower and surmounting chevrons flatter (*i. e.*, less arched).

The type is labelled "Oiwake, June–July 1887." It is a ♂, and not a ♀ as stated by Leech. Pryer (*l. c.*) stated that he only knew of two very worn specimens from Nambu and one good one from Assama-Yama.

### (c) *Scolitantides divina asonis*, Mats.

*Lycæna barine asonis*, Mats., 1929, Ins. Mats. iii. (4), p. 141, "Kiushu, Mt. Aso on Kumamoto."

This subspecies is described as being smaller than *barine*, and differing from it in that the ground-colour on the upperside is pale greyish blue and the discal row of black spots is absent. As, however, it is based on a single ♂ (taken by H. Shirai on August 5th, 1921), it remains to be seen whether these characters are constant, or whether the name should be sunk as a synonym of subsp. *barine*.

*Scolitantides lanty*, Oberth.

*Lycæna lanty*, Oberth., 1886, Et. Ent. xi. p. 21, pl. vii. fig. 53, ♂, "Ta-Tsien-Lou."

The subspecies found in Amdo differs very strikingly from nominotypical *lanty* from Ta-Tsien-Lou. I name it

*Scolitantides lanty* patrocles, subsp. n.

Differs from nominotypical *lanty*, Oberth., as follows:—

♂.—*Upperside.* Ground-colour pale silvery blue (instead of purplish blue); veins inconspicuous (these show clearly in *l. lanty* and appear to be of a paler blue). *Fore wing*: marginal border consists of six small black spots with clear line of pale blue between them and the termen (in *l. lanty* these spots are much larger and there is a blackish suffusion from the termen along the veins). *Hind wing*: black discoidal spot absent (present in *l. lanty*).

♀.—*Upperside.* Ground-colour blue of same colour as the ♂, instead of being dark brown with a slight purplish-blue suffusion. *Fore wing*: black marginal border broader; black discoidal spot very prominent on blue background (large but inconspicuous in *l. lanty*). *Hind wing*: orange marginal lunules much more developed than in *l. lanty*, in which they are absent or vestigial.

♂ ♀.—*Underside.* Ground-colour grey, instead of pale brown; black spots (fore wings and hind wings) much larger. *Fore wing*: submarginal row of black chevrons (*i. e.*, the row between the antimarginal chevrons and the submedian spots) much larger, and nearer to the submedian spots. *Hind wing*: whitish suffusion between orange lunules and submedian spots clearly defined against grey background (inconspicuous in *l. lanty*).

*Length of fore wing*: 14 mm. (16 mm. in *l. lanty*).

*Hab.* Amdo; Thianshan.

♂ *holotype and* ♀ *allotype,* labelled "Amdo, *Gr.-Gr. coll.*" (B.M. types no. Rh. 368 ♂, 369 ♀).

*Paratypes*: ♂ 2, ♀ 1, with same date as holotype (B.M. types no. Rh. 370–1 ♂, 372 ♀).

The Museum also possesses a male of this subspecies labelled "Thianshan, *J. H. Leech coll.*"

The only reference to this subspecies that I can find in the literature is one by Alpheraky (1889, in Romanoff, Mém. Lépid. v. p. 108), who records the capture by G. N. Potanine on May 21st, 1885, near the village Ndami in Amdo, of a single ♂ which differed from specimens from Ta-Tsien-Lou in the intense shining azure-blue of the ground-colour and the increased size of the black spots.

## LXXXI.—*A new Brackish-water Polychæte from Rangoon,* Nereis (Neanthes) meggitti, *sp. n.* By C. C. A. Monro, M.A.

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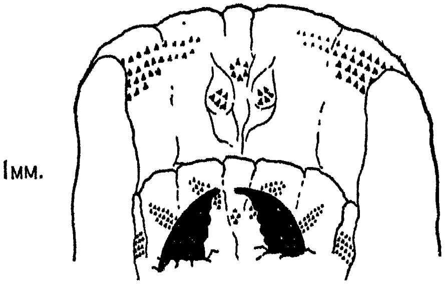
Prof. F. J. Meggitt, of University College, Rangoon, recently sent to the British Museum some Polychæte worms collected on the shore of Rangoon River, forty miles from the mouth. I have no information as to the degree of salinity of the water from which they were taken, but Meggitt states that the river is tidal in that part, and presumably the degree of salinity fluctuates with the state of the tide and the season of the year. The majority of the worms belonged to *Lycastis indica*, first described by Southern from the brackish waters of the Gangetic Delta and the Cochin Backwater, near Ernakulam. One bottle, however, labelled "Latter Street Jetty, Rangoon," contained a number of worms which I am unable to assign to any known species.

Fig. 1.



*Nereis* (*Neanthes*) *meggitti*, sp. n.
Dissection of proboscis from below.

The number of specimens is seven, and of these one is an atocous female, one an epitocous male, and the remainder epitocous females. They are mostly incomplete posteriorly. The average size is 30 mm. by 2 mm. without the feet for about 75 chætigers. In spirit nearly all the colouring is lost, but on the head and on the back of the first five or six segments traces of dark grey pigment can be seen, and there remain the vestiges of a narrow black stripe down the middle of the back. The prostomium is more or less quadrangular, as broad as long, and narrows very little in front. The tentacles are about one-third as long as the head, and slightly shorter than the palps, which are thick and end in button-like palpostyles. The two pairs of eyes are set far back on the prostomium, the members of the anterior pair being more widely separated than those of the posterior pair. The longest of the tentacular cirri reach back to between the 7th and 10th chætigers.

The jaws are brown and have 4 to 5 teeth.

None of the specimens has the proboscis everted, and consequently the exact distribution of the paragnaths (fig. 1) is difficult to determine:—

I. A group of 4 very small paragnaths.
II. An oblique group of 10 to 12 small paragnaths.
III. About 4 rows of numerous small paragnaths.
IV. An oblique group of about 15 paragnaths.
V. A group of 4–6 rather large paragnaths.
VI. A group of 4–5 rather large paragnaths.
VII. and VIII. A continuous band of small paragnaths in about 4 rows. Those at the edges of the areas VIII. farthest from the mid-ventral line are smaller and sparser than the rest and arranged in two rows only.

The buccal segment is about one and a half times as long as the first chætiger. The feet in the anterior segments (fig. 2) have in their upper rami three triangular pointed dorsal lamellæ, of about equal size. The ventral chæta-sac is more prominent than the dorsal, and has the anterior lip more prolonged than the posterior; the ventral lamella is slightly stouter than the dorsal lamellæ, and reaches to the end of the ventral chæta-sac. The dorsal cirrus is slender and projects as far as the end of the upper dorsal lamella, and the ventral cirrus is about half as long as the ventral lamella. The middle dorsal lamella decreases in size from before backwards, so that in the middle segments (fig. 3) it is considerably smaller than the other two dorsal lamellæ, and in the posterior segments it has disappeared. In the posterior segments (fig. 4) there is no substantial enlargement of the upper dorsal lamella, but relatively to the dorsal ramus the ventral ramus is much reduced.

In the dorsal ramus there are homogomph spinigers only, and in the upper part of the ventral ramus there are homogomph spinigers and heterogomph falcigers; in the lower part of the ventral ramus there are heterogomph spinigers and heterogomph falcigers. The acicula are black. In the heterogomph spinigers the difference in length between the two sides of the articulation of the hilt or stalk is less than is usual in the genus. In other respects there is nothing remarkable about the bristles.

With the present material I can say nothing about the pygidium, except that there is a pair of anal styles.

Fig. 2.

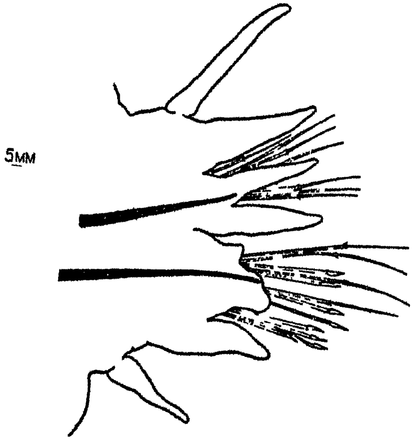
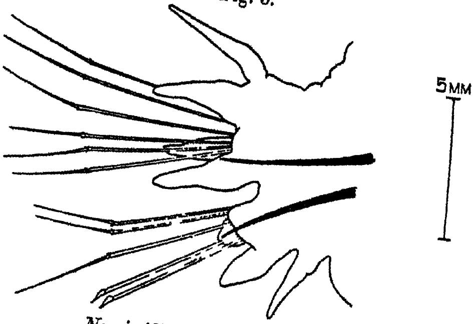


Fig. 3.



*Nereis* (*Neanthes*) *meggitti*, sp. n.

Fig. 2.—Anterior foot from in front.
Fig. 3.—Middle foot from behind.

This species is close to the widely distributed estuarine *Nereis* (*Neanthes*) *succinea* (Leuckart), but differs from it in a number of characters, notably in the absence of the great enlargement of the upper dorsal lamella in the posterior region. Of the fresh and brackish water nereids only two have been described which, because of the character of the paragnaths, fall within the subgenus *Neanthes*: these are *Nereis* (*Neanthes*) *reducta*, Southern, from the Chilka Lake, and the other is *Nereis* (*Neanthes*) *nouhuysi*, Horst, from a river in the island of Taliaboe or Taliabu in the Banda Sea. From both of these the present species differs in the arrangement of the paragnaths and the structure of the feet.

Fig. 4.

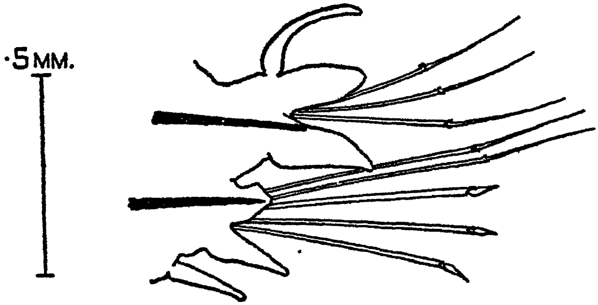
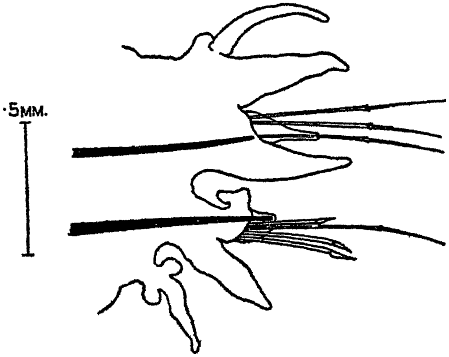


Fig. 5.



*Nereis* (*Neanthes*) *meggitti*, sp. n.

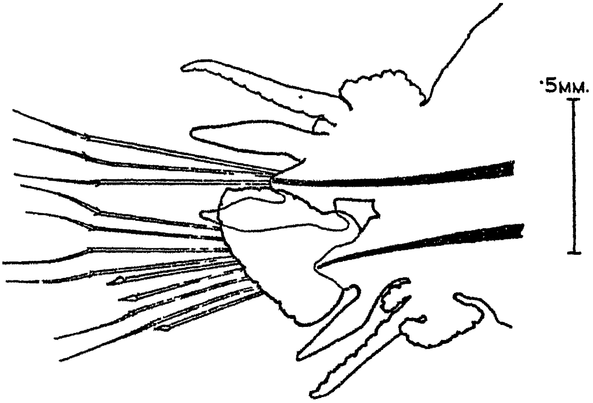
Fig. 4.—Posterior foot from behind.
Fig. 5.—Modified foot of female heteronereid.

In the female heteronereids the body-wall is thin and semitransparent, and the body-cavity tightly packed with eggs: the musculature is reduced and the diameter of the individual ova is between 120 and 125 $\mu$.

The epitocous modification begins at the 19th chætiger, and, except for a very small process above the dorsal cirrus, is confined to the development of small lamellæ on the ventral ramus only (fig. 5). No swimming-bristles are developed, but the ordinary atocous bristles seem to be less numerous than in the unmodified segments. I have not seen more than one heterogomph spiniger in any modified foot. Considering that the female heteronereids appear to be completely sexually mature, one would expect to see much greater epitocous changes in the feet.

The male heteronereid does not appear to be as ripe sexually as the females, but, as may be seen in the figure, the feet (fig. 6) are much more modified than they are in the females. The epitocous condition begins at the 15th chætiger, there is no enlargement of the dorsal cirri in the anterior chætigers, and, as in the females, the transition from the unmodified to the modified region is gradual. No swimming-bristles are developed.

Fig. 6.



*Nereis* (*Neanthes*) *meggitti*, sp. n.
Modified foot of male heteronereid.

The very slight epitocous modifications of the feet in the apparently ripe female heteronereids suggests that the sexual metamorphosis has been arrested. And although the male heteronereid cannot be said to display equal signs of ripeness, the absence of swimming-bristles from otherwise highly modified epitocous feet would seem to indicate that here, too, the change towards the heteronereid condition has been partly inhibited. Moreover, one can hardly suppose that one sex should suffer a complete change involving an entirely different mode of life unless the other did, especially as, to speak teleologically, the end of the change is reproduction.

Now, in a number of nereids adapted to a fresh-water and brackish-water habitat the change to the epitocous condition does not take place: examples are *Nereis limnicola*, Johnson, *Lycastis hawaiiensis*, Johnson, *Nereis diversicolor*, O.F.M., *Nereis glandicincta*, Southern, and *Lycastis ouanaryensis*, Gravier; on the other hand, in *Nereis chilkaensis*, Southern, and in *Nereis nouhuysi*, Horst, the complete heteronereid change has been observed.

I am inclined to the opinion that in the present specimens we have the vestiges of the complete heteronereid changes undergone in the past by the species while it lived in the sea, and that whereas the complete epitocous transformation, owing to the adoption of a river-habitat, no longer comes about, traces of it remain in the partial modification of the feet at the time of sexual maturity. It is to be regretted that nothing is known of the length of time that has elapsed since this species has penetrated into brackish water, for such knowledge might throw light on the speed of certain evolutionary processes.

Gravier (1905, pp. 212–223) describes and discusses an analogous condition in *Perinereis seurati*, Gravier, and reviews the whole question of the adoption of fresh-water habitats by the Polychæta; and in regard to the differences in development between fresh-water animals and their marine relatives, he quotes the following passage from Fritz Müller's 'Für Darwin' (Fritz Müller, 1869, p. 117):—"As the conversion of the original development with metamorphosis into direct development is here under discussion, this may be the proper place to say a word as to the already indicated absence of metamorphosis in fresh-water and terrestrial animals, the marine allies of which still undergo a transformation. This circumstance seems to be explicable in two ways. Either species without a metamorphosis migrated especially into the fresh-waters, or the metamorphosis was more rapidly got rid of in the emigrants than in their fellows remaining in the sea."

## LIST OF PAPERS CITED.

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MÜLLER, FRITZ. 1869. 'Für Darwin.' English translation by W. S. Dallas. John Murray: London. 144 pp., 67 text-figs.

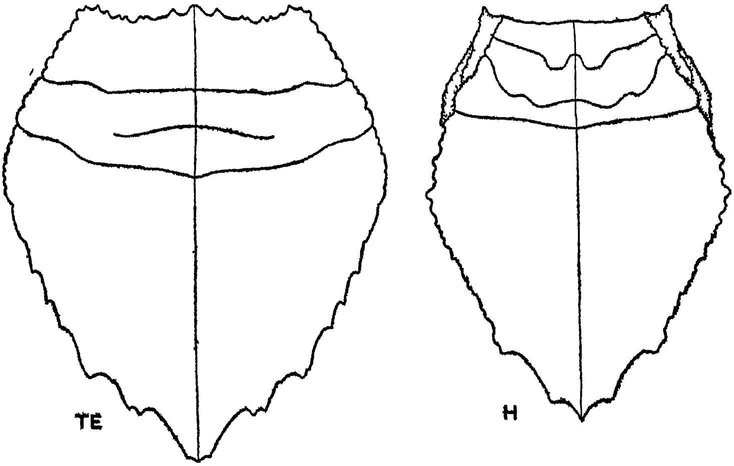
## LXXXII.—*Five new Species of the Genus* Batrachotetrix, *Sauss.* (*Orthoptera,* Acrididæ). By B. P. Uvarov.

### *Batrachotetrix tectinota,* sp. n. (Figs. 1 & 4, TE.)

♀.—Large, with the elytra rudimentary.

Face, vertex, and cheeks covered densely with sand-like granules ; occiput and the hindmost portion of the cheeks practically smooth. Frontal ridge low, very feebly prominent between antennæ and slightly sulcate, obsolescent below the median ocellus. Vertex about as broad as long, moderately sloping, scarcely concave ; its antero-lateral margins obtuse, lateral margins wrinkled.

Fig. 1.



TE, *Batrachotetrix tectinota,* sp. n., ♀ ; H, *B. hemiptera,* sp. n., ♀.

Pronotum large, the surface densely covered with sand-like granules and wrinkled. The disc distinctly roof-shaped. Median carina distinct throughout, linear, with a fine sulcus. Lateral carinæ developed only in the prozona, where they are obtuse and irregular. Transverse sulci fine, but distinct. Anterior margin thin, with acute triangular denticles. Metazona in the shape of an equilateral triangle, with irregular teeth-like tubercles along the margins ; the apex acute.

Elytron minute, narrow, parallel-sided, with the apex rounded, just reaching the first tergite (in the paratype elytra are absent altogether).

Abdominal tympanum small; the membrane appears thick and probably not functioning.

Hind femur strongly flattened and expanded. Upper carina with sharp irregular teeth. Lower carina strongly expanded, regularly convex.

General colour pale greyish ochraceous. Hind femur on the interno-median area with a network of bluish-grey lines and the lower sulcus orange-red. Hind tibia steel-grey, with the spines orange-red, black-tipped.

Total length 40; pronotum 16·5; maximum width of pronotal disc 13·5; length of hind femur 17; maximum width of hind femur 7·5 mm.

Described from two females taken at Matjesfontein, Cape Province, 6–15. x. 1928 (*R. E. Turner*).

The roof-shaped pronotum and strongly expanded hind femora distinguish this species from others of the same genus and may make necessary the erection of a new genus, but I refrain from doing so until the male is known.

### *Batrachotetrix turneri*, sp. n. (Figs. 2, 3, & 4, TU.)

♀ (*type*).—Size under medium for the genus.

Face in dense sand-like granules; cheeks less densely granulated, becoming smooth behind. Frontal ridge projecting between the antennæ in a rounded obtuse angle, strongly depressed at the ocellum, obsolescent below it. Vertex longer than broad, strongly sloping, moderately concave, with sharp, strongly wrinkled margins. Occiput with radial carinulæ behind the eyes and a low median carinula, with cell-like sculpture along the latter.

Pronotum with the disc practically flat, oval-shaped, densely sand-grained and with some slightly larger tubercles. Median carina represented in the prozona by a fine sulcus and a line of granules on each side of it; in the metazona it forms an elongated tubercle just behind the typical sulcus and disappears farther behind. Lateral carinæ distinct throughout, densely granose, with some acute tubercles in the metazona. Anterior margin of the disc practically straight and smooth. Apical angle acute.

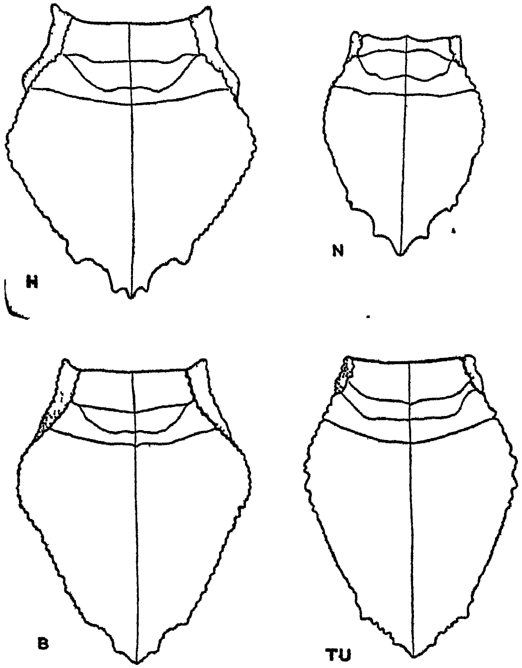
Elytra completely concealed under the pronotum and probably absent.

Hind femur strongly rugose and sand-grained. Upper carina irregularly dentate and tuberculate. Lower carina moderately expanded, irregularly wavy and tuberculate.

General colour greyish ochraceous. Inner side of the hind femur rosy-red, with a series of bluish-black dots along each margin ; lower sulcus bright red. Hind tibiæ greyish blue in the basal half, bright red in the apical; all external and the proximal inner spines pale yellowish, distal inner spines orange-red. Tarsus orange-red.

♂ (*paratype*).—Pronotal disc elongate-rhomboidal, with the margins in the prozona practically straight and the apex with two obtuse lateral projections. Elytra fully developed. Hind femur on the inner side and the whole of hind tibia, except the blue base, are bright red.

Fig. 2.



H, *Batrachotetrix hemiptera*, sp. n., ♂ ; N, *B. nana*, sp. n., ♂ ;
B, *B. braini*, sp. n., ♂ ; TU, *B. turneri*, sp. n., ♂.

Total length, ♂ 16·5, ♀ 33 ; length of pronotum, ♂ 8, ♀ 14·5 ; maximum width of pronotum, ♂ 6, ♀ 11·5 ; elytron, ♂ 15 ; hind femur, ♂ 9, ♀ 14 mm.

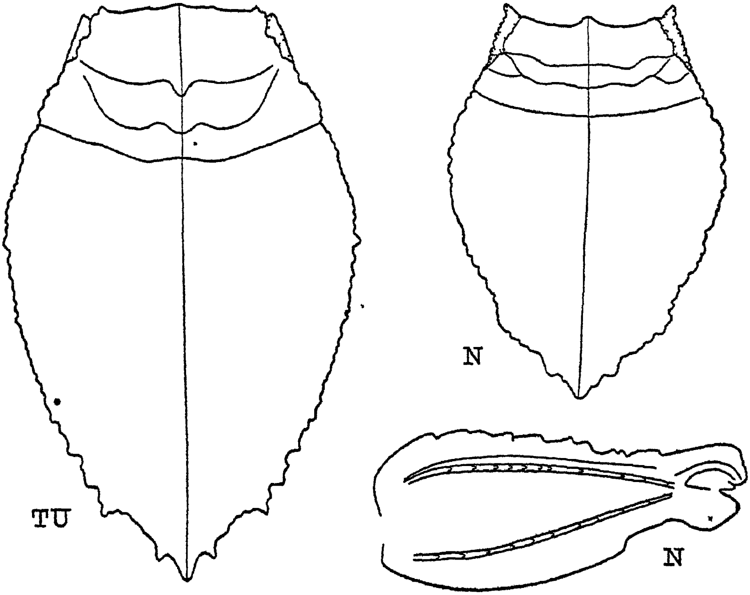
One female (type) and two males (paratypes) from Matjesfontein, Cape Province, 6–21. x. 1928 (*R. E. Turner*).

*Batrachotetrix nana*, sp. n. (Figs. 2 & 3, N.)

♀ (*type*).—Smaller than any known species, with well-visible lateral elytra.

Sand-like granules on the head and the face moderately dense, but very distinct. Frontal ridge rounded-prominent between antennæ, depressed at the ocellum, low but perceptible from the ocellum downwards, and strongly divergent at the clypeus. Vertex longer than broad, narrowed in front, strongly sloping, concave, with the margins moderately raised and irregularly wrinkled. Occiput as in *B. turneri.*

Fig. 3.



TU, *Batrachotetrix turneri*, sp. n., ♀ ; N, *B. nana*, sp. n., ♀.

Disc of the pronotum oval, somewhat concave, very uneven and sand-grained. Median carina in the prozona somewhat raised and thick, in the metazona linear, distinct. Lateral carinæ as in *B. turneri.* Anterior margin of the disc smooth, with an obtuse median angle. Apical angle obtuse, with obtuse subapical teeth. Typical transverse sulcus very distinct, lying in a depression.

Elytra lateral, extending as far as the apex of the pronotum.

Hind femur strongly rugose and sand-grained. Upper carina irregularly dentate and tuberculate. Lower carina moderately expanded, rather suddenly narrowed before the apex.

General colour brownish grey. Inner side and lower sulcus of the hind femur carmine-red, with blue-black dots along the carinæ. Hind tibia carmine-red on the inner side, blue along the upper side, the blue colour spreading to the base of each internal spine, which are pink with black tips.

♂ (*paratype*).—Very small for the genus. Median carina of the pronotum well raised and thick in the prozona, terminating abruptly at the typical sulcus. Metazona distinctly depressed in front and again near the apex. Hind tibiæ with the blue colour only at the base; internal spines black.

Total length, ♂ 13, ♀ 26 (abdomen extended); pronotum, ♂ 5·5, ♀ 10; maximum width of pronotum, ♂ 4·5, ♀ 8; elytron, ♂ 11, ♀ 5·5; hind femur, ♂ 7·5, ♀ 11 mm.

Three females (including the type) and one male from Matjesfontein, Cape Province, 6–21. x. 1928 (*R. E. Turner*).

### *Batrachotetrix braini*, sp. n. (Fig. 2, B.)

♂ (*type*).—Head and face very finely and densely sand-grained. Frontal ridge rounded-prominent between antennæ, depressed at the ocellum, distinct, but weak, below the latter. Vertex longer than broad, distinctly narrowed in front, concave, with the margins smooth, moderately raised.

Pronotum rhomboidal, with the antero-lateral margins distinctly incurved. Disc weakly concave, very densely sand-grained. Median carina in the prozona somewhat raised, fairly thick, with a fine median sulcus; in the metazona it is distinct and slightly raised anteriorly and obsolescent posteriorly. Lateral carinæ sharp, granulose. Anterior margin of the disc obtusely angulate in the middle. Posterior angle about right, with two obtuse lateral angles.

Elytra extending beyond the hind knees.

Hind femur moderately expanded, rather thick. Upper carina coarsely and acutely denticulate. Externo-median area with a tubercle in the apical third. Lower carina feebly expanded, crenulate, rather suddenly narrowed before the apex.

General colour ash-grey. Hind femur on the inner side deep carmine-red, with blue apex and pale yellowish knee-lobe. Hind tibia blue in the basal half and carmine-red in the rest ; inner spines black.

Total length 18 ; pronotum 8 ; maximum width of pronotum 6·5 ; elytron 14·5 ; hind femur 10 mm.

A single male from Barroe, Cape Province, 17. x. 1920 (*Ch. K. Brain*).

*Batrachotetrix hemiptera*, sp. n. (Figs. 1, 2, & 4, H.)

♀ (*type*).—Of medium size, with semi-developed elytra.

Head and face densely and minutely sand-grained. Frontal ridge broadly rounded-prominent between antennæ, depressed and constricted at the ocellum, widened below it. Vertex about as broad as long, strongly sloping, feebly concave; margins strongly raised, regularly wrinkled. Postocular radial carinulæ distinct. A fine median carinula, finely sulcate in front, runs throughout the vertex and occiput.

Pronotal disc elongate-elliptical, slightly convex on the prozona and the anterior half of the metazona, slightly concave in the apical part of the latter. Median carina linear throughout, more distinct in the metazona. Lateral carinæ sharp, coarsely dentate. Typical sulcus deep. Anterior margin practically straight. Posterior angle acute, but the tip rounded ; there are two obtuse preapical angles.

Elytra reaching the base of hind knees, covering each other at the back, *i. e.*, only abbreviated, but not rudimentary.

Hind femur strongly compressed and expanded. Upper carina with irregular and acute crenulation. Lower carina strongly expanded, rather suddenly narrowed near the apex, irregularly crenulate in the apical half.

General colour brownish. Inner side of the hind femur bluish black, with a pale preapical ring and pale knee-lobe. Hind tibia bluish black, becoming red apically.

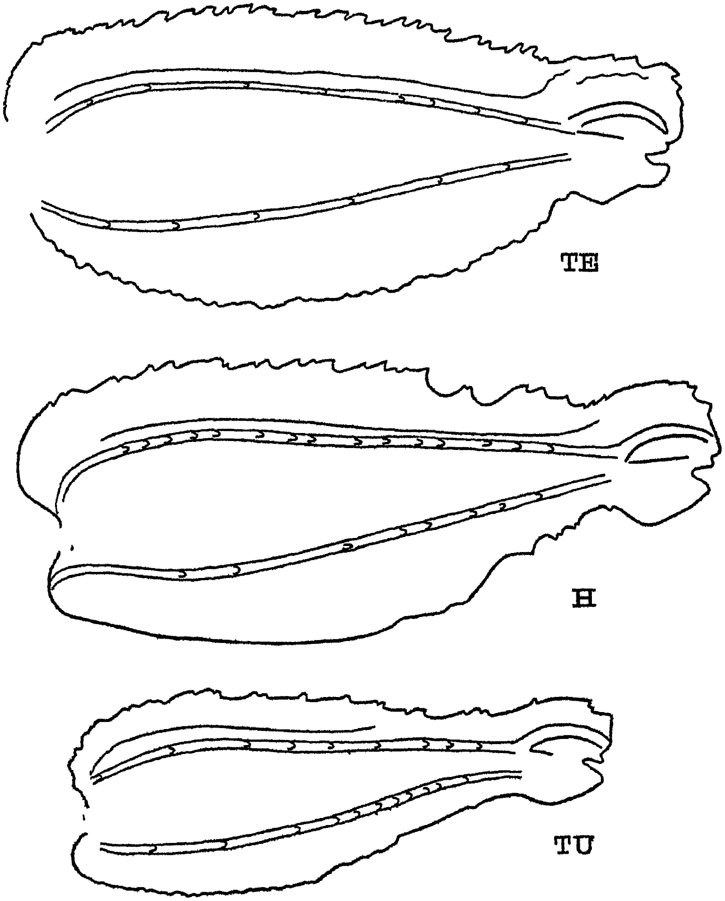
♂ (*paratype*).—Pronotal disc pear-shaped, with the apical angle somewhat rounded.

Total length, ♂ 20, ♀ 36 ; pronotum, ♂ 8, ♀ 16 ; maximum width of pronotum, ♂ 6, ♀ 12 ; elytron, ♂ 14·5, ♀ 17 ; hind femur, ♂ (missing), ♀ 18 mm.

One male and one female (type) from Deelfontein, Cape Province (*Col. Sloggett*).

I am not certain that the male is conspecific with the female type, the more so that there is in the British Museum collection another male from the same locality, but differing in the shape of pronotum. The female, however, is exceedingly well characterised by the relatively large elytra.

Fig. 4.



TE, *Batrachotetrix tectinota,* sp. n., ♀ ; H, *B. hemiptera,* sp. n., ♀ ; TU, *B. turneri,* sp. n., ♀.

The types of all these new species are in the British Museum of Natural History.

## LXXXIII.—*A Note on the Hatching of some Weevils* (Curculionidæ) *from the Egg.* By A. W. Rymer Roberts, Molteno Institute of Parasitology, University of Cambridge.

In a recent paper of great interest Sikes and Wigglesworth (Q. J. Micr. Sci. lxxiv. 1931, pp. 165–192) have put on record a number of fresh observations on the hatching of insects from the egg and the appearance of air in the tracheal system of the young larva in six different orders. In addition, they have referred in the course of discussion to the results obtained by a number of earlier workers in the same field. From these it is evident that the physiological processes going on within the egg and its contained embryo result in several different methods of hatching.

In the course of obtaining the ova and young larvæ of several weevils for another purpose, there has lately come to the writer an opportunity of watching the process in different stages of development, and it seems desirable to make note of these observations, incomplete though they are in certain respects. Most of them have been made on three species of *Phyllobius*, viz. *P oblongus*, L , *P. urticæ*, Deg., and *P. parvulus*, Oliv. (*viridiæris* auct.), and in these three species the process is, so far as ascertained, the same. Mr. W. E. H. Hodson, of Reading University, has kindly given me a microscopic mount of *Otiorrhynchus sulcatus*, F., including both the emerging larvæ and the egg-shells at the time of hatching. The appearance of both leads to the supposition that the process of hatching here follows the same rule as in *Phyllobius*, and Mr. Hodson's recollection of it also confirms this supposition. But in the few ova of *Magdalis armigera*, Gf., which were available for observation, the process differed entirely.

### 1. *Hatching in* Phyllobius.

The incubation-period in the three species observed extends from eleven to sixteen days (or even eighteen days in the case of *P. urticæ*), and is doubtless dependent on external factors such as temperature for its variation. Some difficulty was experienced in providing a supposedly proper degree of humidity on account of the growth of moulds, which readily appeared in a damp atmosphere. Most of the eggs were therefore kept under drier conditions than would be supposed to be normal.

Two or three days before hatching the first eggs appeared about to shrivel up, a more or less longitudinal fold appearing in the shell; but, since this fold was afterwards noticed in most of the eggs which hatched successfully, it is concluded that its presence is a normal part of the process. Certainly in the case of one egg which lacked it, and which was under observation for four days, the larva though active at first was never able to break open the shell.

At this stage the larva is perfectly formed, even to the setæ, and the mandibles are coloured brown; but the spiracles and tracheal system are not yet filled with air. The body of the larva is somewhat flexed at the posterior end, but the extent of the flex appears to vary to some degree with the species; in *P. urticæ* the flex is comparatively slight, and the larva in one case had so much freedom within the egg that it was observed to reverse its position, the head coming to occupy the posterior pole of the egg. The dorsal region is always pressed against the curved side of the egg, and the whole larva is bathed in fluid. There is, however, a bubble of air in contact with the base of the head and the prothorax, chiefly on the ventral side, and this extends somewhat further before the larva hatches. In addition, a smaller bubble may be present in an uncertain position near the posterior end of the larva.

The mandibles and maxillæ from this stage onwards are actively employed at intervals in contact with the chorion, evidently seeking some point of inequality or weakness in the surface through which the mandible can be thrust. When this is found the larva thrusts one only of the widely extended mandibles through the shell, and, rotating it through an angle of 90° or more, brings the ventral surface of the mandible against the outer surface of the shell, so, if successful, enlarging the breach in the shell. The mandible is now again within the egg and has slipped from its position. The maxillary palp and apex of the mandible are therefore again employed to find the point at which the shell has been broken and the process is repeated. The action is not one of incision by the two mandibles acting together, as might have been supposed, but is performed by one mandible only. The point of rupture is in the anterior third of the egg, varying in exact position owing to the power of movement of the head.

The vitelline membrane seems to have disappeared and there is no embryonic membrane to impede the larva, which after the shell has been broken is soon able to put out its head. From this point the remainder of the process of hatching is easy and rapid; indeed, in favourable circumstances the whole process from penetration of the shell to complete freeing of the larva may take no longer than ten to fifteen minutes.

As regards the appearance of air in the tracheæ and spiracles, careful examination of ova in water under a high magnification (×480) revealed certain of the spiracles and (dimly) tracheæ, but it was quite evident from the behaviour of the thin film of air which from time to time passed over them with the movements of the larva that they contained no air before the shell was ruptured. As soon as the larva is hatched, however, and it is immersed in a fluid, the spiracles, the main tracheal trunks, and the principal tracheæ are readily visible by reason of the air contained in them. From these facts it may reasonably be concluded that air enters the spiracles, and from them the tracheæ, at the time when the shell is ruptured by the mandible of the larva. As to the tracheal fluid, it is evidently absorbed from the tracheal system into the tissues in the manner propounded by Weismann (Zeitsch. wiss. Zool. xiii. (1863) pp. 190–196) and in greater detail by Keilin (Proc. Camb. Phil. Soc. [Biol.] i. (1924) pp. 63–70).

In one case where the shell was broken accidentally and the larva somewhat crushed, being then some twelve hours from its proper time of hatching, no air was observed to penetrate the tracheæ. It appears, therefore, that the entry of the air is not merely mechanical, depending on the contact between the outside air and the spiracles, but is dependent on the combination of these conditions with a due degree of maturity of the larva, whereby it is enabled to make use of them—in other words, that the tissues shall be capable of absorbing the fluid contained in the tracheæ at the time that the increased supply of air is available.

## 2. *Hatching in* Magdalis armigera, *Gf.*

The process is evidently quite different in this species, though unfortunately few observations were made on the preliminary stages. The eggs, which when first laid are yellow and broader in proportion to their length than those of *Phyllobius*, become irregularly wrinkled a few days before hatching. This takes place apparently solely through the pressure exerted by the larva within the egg-shell, which is ruptured transversely in the middle region. The thoracic and median parts of the larva are then thrust out and a peristaltic swelling of the body takes place for the freeing of the head and posterior end of the larva. In the cases observed this was a matter of some difficulty, the two ends of the larva being difficult of release from the embryonic membrane (presumably the vitelline membrane) which still enclosed them, though the median parts of the larva were free.

In one case the posterior end was observed to be free while the head was enclosed, the peristaltic movements still taking place for the freeing of the head with the body extended in the air. It is possible that this difficulty was caused through an abnormal dryness of the eggs and surrounding atmosphere, for it was found necessary to extract the head from the membrane with needles after some hours' struggle on the part of two of the larvæ, while a third was preserved with the head still enclosed in membrane.

The shapes of both egg and larva differ from those of *Phyllobius*, the egg being somewhat wider, and the larva in proportion considerably thicker dorso-ventrally in *Magdalis*. The fact that the larva is so much thicker in its dimensions may play an important part in the process of hatching, for the setæ are sparse and extremely slender, while no trace of any process which could be used as an egg-burster has been discovered. The young larva, like the egg, is rather deeply coloured yellow.

No observations of any value were made on the entrance of air into the tracheal system, the simple spiracles being extremely small and difficult to discern, even in a prepared specimen.

### *Summary.*

Observations have been made on the method of hatching of two different genera of weevils (Coleopt., Curculionidæ) from the egg. In *Phyllobius* the young larva bites its way through the chorion and emerges head first. Evidence is given for the belief that air first enters the tracheal system at this stage. No embryonic membrane is present to impede its exit. In *Magdalis*, on the other hand, the larva bursts open the chorion through internal pressure on its walls, and the median parts of the dorsum first emerge, the head and posterior regions both being for a time retained within the ruptured embryonic membrane and chorion. No trace of an "egg-burster" was found in either genus. It is remarkable that two genera within the same family should exhibit such different methods of hatching.

## LXXXIV.—*Notes on Flatfishes (Heterosomata).—III. Collections from China, Japan, and the Hawaiian Islands.* By J. R. NORMAN.

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THE following notes and descriptions are based on three collections recently received by the Museum, which, although small, are of special interest, and include examples of several species not previously represented in the national collection. They are:—

1. Twenty-five specimens from Japan, representing a part of the collections made by Haberer and Doflein, which were the subject of a report by Franz in 1910 [*]; including co-types of three species described by him. Sent on loan through the kindness of Dr. O. Schindler, Zoologische Sammlung des Bayerischen Staates, München.

2. Twelve specimens from Japan and the Hawaiian Islands, including co-types of five species described by Gilbert [†]. Received, partly as an exchange and partly as a loan, from the United States National Museum, Washington.

3. Sixteen specimens from China, including examples of two species new to the collection. Presented by Professor Johnson Chen, Department of Zoology, Sun Yatsen University, Canton.

To all the gentlemen and the authorities of the institutions mentioned my thanks are due and are gratefully tendered.

### Bothidæ.

### *PARALICHTHINÆ.*

### PSEUDORHOMBUS, Bleeker.

*Spinirhombus*, Oshima, cannot be maintained as a distinct genus. I have already shown [‡] that the presence or absence of the so-called pre-anal spine (*i.e.*, the tip of the first interhæmal spine), may be a variable feature (*e.g.*, in *P. triocellatus, malayanus, elevatus*, and *javanicus*), and may even depend merely upon the manner in which a particular specimen has been preserved. Of the three new species of *Spinirhombus* described by Oshima, *S. ctenosquamis* is closely related to *P. arsius* (Hamilton-Buchanan), *S. taiwanus* appears to be identical with *P. cinnamoneus* (Temminck & Schlegel), and *S. levisquamis* is probably identical with *P. javanicus* (Bleeker).

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[*] Abh. Bayer. Ak. Wiss. München, Suppl. Bd. iv. Abh. 1, pp. 60–66.

[†] Bull. U.S. Fish. Comm. xxiii. (2), (1903) 1905, pp. 679–691.

[‡] Rec. Indian Mus. xxix. 1927, pp. 11–17.

*Rhombus oligolepis*, Bleeker, also placed by Oshima in *Spinirhombus*, is the genotype of *Tarphops*, Jordan & Thompson, distinguished from *Pseudorhombus* by its small size (examples of 74 mm. have been recorded with ripe ova) and by the larger scales.

### *Pseudorhombus javanicus* (Bleeker).

Two specimens from Hongkong and Hainan agree fairly well with Oshima's description of *Spinirhombus levisquamis*, and suggest that this species is a synonym of the above. There are, however, 12 to 15 gill-rakers on the lower part of the anterior arch, whereas Oshima counts 9, and the origin of the dorsal fin is a little in front of the eye instead of above its anterior margin. So far as the numbers of dorsal and anal rays are concerned, Oshima gives D. 84, A. 59; I count D. 78, A. 56 in the above-mentioned Chinese examples; and in authentic specimens of *P. javanicus* in the British Museum there are D. 69–73, A. 53–56. On the ocular side of the body the scales are cycloid, except anteriorly, where they are ctenoid; on the blind side all the scales are cycloid.

### *Pseudorhombus oligodon* (Bleeker).

Weber and Beaufort[*] unite *P. malayanus*, Bleeker, with this species. The two are closely related, but examination of some twenty specimens suggests that they may be separated by the following characters:—

I. Depth 1¾ to 2 in length, head 3⅕ to 3⅓; maxillary extending to below hinder edge or posterior part of eye, 2⅓ to 2¼ in head; dorsal 71–77; anal 55–61; pectoral of blind side 1¾ to about 2 in head .............. *malayanus.*
II. Depth 2 to 2¼ in length, head 3⅓ to 3⅔; maxillary not reaching hinder edge of eye, 2 to 2⅙ in head; dorsal 78–81; anal 61–64; pectoral of blind side 2⅓ to 2¼ in head ......................................... *oligodon.*

*P. malayanus* is found from the east coast of India, through the Malay Archipelago to the Philippines; *P. oligodon* appears to be confined to China and Japan. The specimens identified by Jordan and Starks (1906), Hubbs (1915), Fowler and Bean (1922), and Oshima (1927) as *P. cinnamoneus* probably represent *P. oligodon.*

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[*] Fish. Indo-Austral. Arch. v. 1929, p. 101.

### *Pseudorhombus cinnamoneus* (Temminck & Schlegel).

*P. misakius*, Jordan & Starks, is almost certainly this species. *P. formosanus*, Oshima, and *Spinirhombus taiwanus*, Oshima, will probably also prove to be synonymous.

### *Pseudorhombus pentophthalmus*, Günther.

Examination of a series of specimens from Japan has convinced me that *P. ocellifer*, Regan, is identical with this species. The size of the eye appears to be more variable than in most other species of *Pseudorhombus*.

### *Tæniopsetta radula*, Gilbert.

Two co-types (♂, 92 mm.; ♀, 110 mm.) examined.

Comparison with the types of *T. ocellata* (Günther) shows that this species is quite distinct. In *T. radula* the scales are smaller and ctenoid on the ocular side, the body is somewhat deeper, the coloration different, and some of the rays of the dorsal and anal fins are prolonged in both sexes.

## *BOTHINÆ.*

### ARNOGLOSSUS, Bleeker.

I am unable to recognize *Anticitharus*, Günther, except, perhaps, as a subgenus of *Arnoglossus*. *Caulopsetta*, Gill (genotype, *Pleuronectes scapha*, Forster) is also synonymous.

### *Arnoglossus* (*Anticitharus*) *debilis* (Gilbert).

A co-type (142 mm.) examined.

Close to *A. scapha* (Forster) and *A. boops** (Hector), but readily distinguished by the somewhat smaller scales, which are cycloid on both sides of the body.

### PSETTINA, Hubbs.

There seems to be little doubt that *Crossolepis*, Norman, is a synonym of *Psettina*. Apart from the peculiar scales † and somewhat smaller mouth, this genus is exactly like *Arnoglossus*, and bears the same relation to that genus as does *Crossorhombus* to *Engyprosopon*.

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* Originally described as a *Pseudorhombus*.

† See Norman, Rec. Ind. Mus. xxix. 1927, pp. 22, 29.

### *Psettina iijimæ*, Jordan & Starks.

Examination of five specimens (66 to 110 mm.) of *Arnoglossus profundus*, Weber, including four collected by the 'Siboga'*, shows that this species is identical with *Psettina iijimæ*, of which I have seen one specimen (110 mm.) from Oki Shima. This species is distinct from *P. brevirictis* (Alcock), which has fewer dorsal and anal rays, a deeper body, and smaller mouth.

### *Crossorhombus azureus* (Alcock).

*Scæops kobensis*, Jordan & Starks, from Japan, and *Platophrys microstoma*, Weber, from the Indo-Australian Archipelago, are synonyms of this species, which ranges from south-eastern India and Ceylon to China and Japan. *C. valderostratus* (Alcock) [=*C. dimorphus*, Gilchrist] may eventually prove to be identical with the above, but appears to have a wider interorbital space, the upper eye farther back, and the upper pectoral ray prolonged in mature males.

### Parabothus, gen. nov.

Genotype, *Arnoglossus polylepis*, Alcock.

The characters and relationships of this genus may be expressed by the following synopsis:—

Interorbital region concave (except in the very young), generally broad in adult males; lateral line absent or feebly developed on blind side of body.
- I. Less than 65 scales in lateral line; gill-opening extending upwards to lateral line, or ending a short distance above pectoral fin, in which case the scaling of head and body is continuous below lateral line ...................... [Rhombus, Perissias, Engyprosopon, Crosso-
- II. More than 74 scales in lateral line.
  - A. Lower eye well in advance of upper; males nearly always with rostral and orbital spines; teeth in jaws in two or more series (at least anteriorly); upper angle of gill-opening a short distance above pectoral fin, the membrane joining operculum to pectoral arch scaleless ........................ Bothus.
  - B. Lower eye only a little in advance of upper; males without rostral or orbital spines; teeth uniserial in both jaws; upper angle of gill-opening close to lateral line, the membrane joining operculum to pectoral arch partly scaled........ Parabothus.

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* See Weber & Beaufort, Fish. Indo-Austral. Arch. v. 1929, p. 127.

### *Parabothus coarctatus* (Gilbert).

A co-type (154 mm.) examined.

Differs from *P. polylepis* (Alcock) chiefly in the smaller head, more slender body, smaller scales, and greater number of dorsal and anal rays.

### *Parabothus chlorospilus* (Gilbert).

[=*Platophrys inermis*, Gilbert.]

Two co-types (♂, 97 mm.; ♀, 165 mm.) examined.

Closely related to the preceding species, but with fewer dorsal and anal rays, somewhat larger scales, larger eye and longer maxillary, etc.

### *Parabothus* (?) *violaceus* (Franz).

I have not seen examples of this species, which may be provisionally placed in the genus *Parabothus*. It appears to be close to *P. chlorospilus* and *coarctatus*.

### *Chascanopsetta lugubris*, Alcock.

Examination of five co-types of *Trachypterophrys raptator*, Franz, from Japan, shows that this species is synonymous with the above. *Chascanopsetta prorigera*, Gilbert, from the Hawaiian Islands, has a smaller mouth and a somewhat shorter arch in the lateral line.

## LÆOPS, Günther.

*Scianectes* and *Lambdopsetta* are synonyms of *Læops*, the type-species of which (*L. parviceps*) has the first two dorsal rays detached from the remainder of the fin. *Læoptichthys*, Hubbs, is said to differ in having the teeth in "a single even row," but within the genus *Læops* the arrangement of the teeth varies from a single irregular series to a narrow band in each jaw. Further, in young or poorly-preserved specimens it is often very difficult to be certain as to whether the teeth are in one row or more, and the type of the single known species of *Læoptichthys* (*L. fragilis*) was only 68 mm. in total length.

### *Læops kitaharæ* (Smith & Pope).

*Lambdopsetta kitaharæ*, Smith & Pope, Proc. U.S. Nat. Mus. xxxi. 1906, p. 496, fig. 12; Jordan, Tanaka, & Snyder, J. Coll. Sci. Tokyo, xxxiii. 1, 1913, p. 317, fig. 265.

*Læops lanceolata*, Franz, Abh. Bayer. Akad. Wiss., Suppl. Bd. iv. Abh. 1, 1910, p. 62, pl. viii. fig. 60; Hubbs, Proc. U.S. Nat. Mus. xlviii. 1915, p. 460; Jordan & Hubbs, Mem. Carnegie Mus. x. 1925, p. 295.

? *Læops variegata*, Franz, *loc. cit.* p. 63, pl. viii. fig. 59.
? *Læoptichthys fragilis*, Hubbs, Proc. U.S. Nat. Mus. xlviii. 1915, p. 460, pl. xxvi. fig. 4.

Depth of body 3 to 3¼ in the length, length of head 5½ to nearly 6. Upper profile of head and body more or less convex above and behind eyes. Diameter of eye 2⅔ to 3⅓ in length of head. Maxillary extending to a little beyond anterior margin of eye, length 3⅝ to 3⅓ in head. Teeth in narrow bands (? in a single series in young). 6 to 8 gill-rakers on lower part of anterior arch. 98 to 112 scales in lateral line. Dorsal 105–115. Anal 85–95 [*]. Length of pectoral fin of ocular side 1½ to 2 in that of head. Yellowish brown, with or without a series of faint dark blotches at upper and lower edges of body; median fins dusky towards their margins.

*Hab.* Japan.

Described from five specimens, 77 to 87 mm. in total length, co-types of *L. lanceolata.* I have also examined two co-types of *L. variegata*, 77 to 92 mm. in total length; this appears to be a post-larval form.

## **Pleuronectidæ.**

### *PLEURONECTINÆ.*

### PŒCILOPSETTA, Günther.

*Paralimanda*, Breder, is a synonym of the above. *P. inermis* appears to be most nearly related to *P. beanii* (Goode), differing mainly in having larger and cycloid scales, and rather fewer rays in the dorsal and anal fins.

### *SAMARINÆ.*

### SAMARISCUS, Gilbert.

This genus may be readily distinguished from *Samaris* by having none of the rays of the dorsal and pelvic fins greatly prolonged, and the middle rays of the caudal fin branched. *Plagiopsetta glossa*, Franz, from Japan, may be placed in this genus [†].

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[*] There are said to be 76 anal rays in the type of *L. kitaharæ.*

[†] Dr. Schindler informs me that the type of this species cannot be found. Judging from the published figure, the pectoral fin appears to have about 10 rays, a higher number than in any other species.

### *Key to the Species of* Samariscus.

I. Depth $2\frac{1}{8}$ to $2\frac{2}{5}$ in length; maxillary $3\frac{1}{2}$ to $3\frac{2}{3}$ in head.
  A. Depth $2\frac{1}{8}$ in length; eye $3\frac{1}{2}$ in head; dorsal 70; anal 53 .............. 1. *glossa* (Franz).
  B. Depth about $2\frac{2}{5}$ in length; eye nearly 4 in head; dorsal 63–67; anal 48–50 ............................ 2. *inornatus* (Lloyd).
II. Depth $2\frac{3}{5}$ to $3\frac{2}{5}$ in length; maxillary $2\frac{1}{4}$ to 3 in head.
  A. Pectoral twice as long as head or more.
    1. Head 4 to $4\frac{3}{4}$ in length; eye $2\frac{3}{4}$ to a little more than 3, maxillary $2\frac{1}{5}$ to nearly $2\frac{1}{2}$ in head; 68 to 74 scales in lateral line .......... 3. *sunieri*, Weber & Beaufort.
    2. Head $3\frac{1}{2}$ to $3\frac{2}{3}$ in length; eye $3\frac{1}{2}$ to $3\frac{3}{4}$, maxillary about 3 in head; 55 to 60 scales in lateral line ...... 4. *longimanus*, Norman.
  B. Pectoral shorter than, or a little longer than head.
    1. Head $3\frac{3}{4}$ in length; eye $3\frac{1}{2}$, maxillary 3, pectoral $1\frac{1}{4}$ in head; 62 scales in lateral line .......... 5. *maculatus* (Günther).
    2. Head $4\frac{2}{5}$ to $4\frac{3}{4}$ in length; eye 4, maxillary 2 to $2\frac{1}{2}$ in head; pectoral a little longer than head; 74 scales in lateral line .......... 6. *huysmani*, Weber.
    3. Head $4\frac{1}{3}$ to 5 in length; eye $3\frac{1}{2}$ to about 4, maxillary $2\frac{1}{3}$ in head; pectoral nearly as long as head; about 100 scales in lateral line.. 7. *corallinus*, Gilbert.

## Soleidæ.

### *Heteromycteris japonica* (Schlegel).

A single specimen, 112 mm. in total length, from Sama, Hai-Nan, differs somewhat from Japanese examples in the British Museum. It had been my intention to describe this as a new species, but, after discussing the matter with M. Paul Chabanaud, I conclude that it is probably identical with Schlegel's species *. A full description of the specimen is as follows:—

Depth of body 3 in the length, length of head $4\frac{3}{4}$. Rostral hook ending below the space between the nostrils. Central portion of dilated nostril of blind side simple. Diameter of eye greater than interorbital width and about 6 in length of head; anterior edge of lower eye below middle of upper; angle of mouth below anterior part of lower eye, about equidistant from end of snout and upper part of gill-opening; lower lip not ciliated on ocular side. Scales ctenoid on both sides of body, the marginal spinules free, stronger on scales of ocular side; 86 scales from above upper angle of gill-opening to base of caudal, 29 in an oblique series from lateral line to dorsal fin. Dorsal 92. Anal 60.

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* Mr. Chabanaud has recently published a revision of the genus (Ann. & Mag. Nat. Hist. ser. 2, xx. 1927, p. 523). The author is much indebted to him for his assistance.

## LXXXV.—*A new Species of Blind Snake from N.W. Australia.* By H. W. Parker, B.A.

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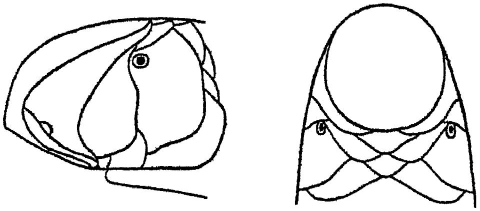
The British Museum is again indebted to Mrs. Grey for an interesting snake from the vicinity of Roebuck Bay, N.W. Australia. The snake, a *Typhlops*, agrees closely with the description and figures ascribed by Waite * to *T. kenti*, Boulenger, but comparison with the type-specimen reveals a large number of discrepancies. The material examined by Waite was all from Western or North-western Australia, whereas the type of *T. kenti* was found in Queensland; comparison of the accompanying figures with those given by Waite will reveal some of the disparities between the two forms. There can be little doubt that the strongly hook-snouted, long-tailed N.W. Australian snake is specifically distinct from that from Queensland, which bears a much greater resemblance to, and may ultimately prove to



*Typhlops kenti*, Boulenger. Type.

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* Waite, Records S. Australian Mus. i. (i.) 1918, p. 22.

be conspecific with, *T. affinis*, Boulenger. At the moment Waite's species appears to lack a name, so it may be called :—

### *Typhlops nigroterminatus.*

*Typhlops kenti* (non Boulenger), Waite, 1918, Rec. S. Austr. Mus. i. (i.) p. 22, fig. 12; Werner, 1921, Arch. f. Naturg. lxxxvii. A. 7, p. 319 (part.); Kinghorn, 1929, Snakes of Australia, p. 59, figs.

Holotype an immature female, number 1931.10.10.1 in the British Museum, from Roebuck Bay, N.W. Australia; collected by Mrs. B. Grey.

Snout prominent, strongly hooked, with sharp cutting-edge and inferior nostrils. Rostral large, more than half as wide as the head, extending posteriorly to the level of the anterior border of the eyes; its lower part as long as broad; nasal entirely divided, the cleft proceeding from the second upper labial; præocular present, narrower than the nasal or the ocular, in contact with the second and third upper labials; no subocular; four upper labials; eyes distinct; frontal and supraoculars enlarged. Diameter of body contained about 90 times in the total length; tail nearly twice as long as broad. Scales in 18 rows at mid-body. Pale brown above, slightly paler beneath; head darker; tail black in its posterior three-fourths.

Total length 270 mm.; tail 5 mm.

*Variation.*—In the four specimens recorded by Waite the ratio of diameter to length varies from 55–102, and, in one, the head is black.

## LXXXVI.—*A new Golden Mole* (Chlorotalpa) *from Mt. Elgon, Uganda.* By J. St. Leger, F.Z.S.

Mr. G. W. Foster has recently kindly presented to the British Museum a large collection of mammals from Mt. Elgon, amongst which the following golden mole proves to be new:—

### *Chlorotalpa fosteri*, sp. n.

A golden mole belonging to the genus *Chlorotalpa*, and resembling *C. stuhlmanni*, Matsch., from the Ruwenzori district, in retaining the primitive character of a vesiculated temporal fossa, a distinct swelling being perceptible, as in that species, on the anterior surface of the cranium inside the posterior plates of the zygomatic arch, but differing by the broader skull and less reduced internal cusp of the last upper premolar and upper molars.

Colour dull brown, not quite so bright a brown as in *stuhlmanni*, but more "gun-metal" in shade, heavily washed iridescent green. A white spot on cheeks on either side of snout, the two spots connected by a white line across upper lip and apparently under the chin. Underside gun-metal grey. Feet and claws both in absolute and in relative size quite as in *stuhlmanni*.

*Skull.*—Breadth of skull greater in proportion to its length than in *stuhlmanni*, so that it somewhat resembles in general appearance the broad short skull of the genus *Chrysochloris*.

*Measurements* (in mm.) of the type of *C. fosteri* as compared with two adult skulls of *stuhlmanni* are :—

| | *C. fosteri.* | *C. stuhlmanni* *<br>(Ruwenzori E.). | *C. stuhlmanni* †<br>(Ruanda). |
|---|---|---|---|
| Condylo-incisive length.. | 22·2 | 22·2 | 23·5 |
| Greatest breadth........ | 17·2 | 15·7 | 16·5 |

Surface of temporal fossa vesiculated, the swelling about as large as in *stuhlmanni*.

*Teeth.*—In the upper jaw first and second incisor simple without any secondary cusps, third incisor with a very small, scarcely perceptible, secondary posterior cusp. Canine with a distinct posterior cusp. Second and third premolars with the internal cusp or hypocone rather less pronounced and lower in relation to the height of the tooth than in *stuhlmanni*. In the lower jaw the talonids of the canine, premolars, and molars are developed as in *stuhlmanni*.

*Type.*—Adult male, spirit-specimen, from which the skin has been removed previous to its immersion in spirit (B.M. no. 31. 11. 1. 3). Mt. Elgon, Uganda, 9300 feet.

*Measurements of Type.*—Head and body not less than 111 mm.; hind foot 12·6; tail, after skinning, 4·5.

*Skull.*—Greatest length 25·6 mm.; condylo-incisive length 22·2; greatest breadth (postero-zygomatic) 17·2; orbital constriction 8·5; length upper tooth-row 10·5; greatest width palate across first molars 7·7.

On the skin-label Mr. Foster writes that the mole makes a noise similar to that emitted by the puff-adder.

* Younger than type of *fosteri*.
† Same age as type of *fosteri*.

The two species *stuhlmanni* and *fosteri* are peculiar in being the only two species of *Chlorotalpa* retaining the primitive feature of a vesiculated temporal fossa, which is constant, but in a slightly more pronounced form, in all species of *Chrysochloris*. This peculiarity in the Ruwenzori and Mt. Elgon forms is all the more remarkable in that all other known species of *Chlorotalpa*, which are found only in Southern Africa (Transvaal and Cape Province), show no traces of this vesiculated temporal fossa, although occurring side by side with the genus *Chrysochloris*, in all known species of which this primitive feature is well marked. *Chlorotalpa fosteri* is further remarkable for the great width of its skull, nearly approaching in this respect the short broad skull of *Chrysochloris*. These two features of a vesiculated temporal fossa in *Chlorotalpa stuhlmanni* and *Chlorotalpa fosteri*, and the great breadth of the skull of *Chlorotalpa fosteri*, leave only the presence of the posterior talonid of the lower second and third premolars and of the lower molars to distinguish *Chlorotalpa* from *Chrysochloris*. This talonid, however, has been found occasionally in individual skulls to be much reduced (sometimes to a mere ledge), and in this connection the variability shown in the formation of the cusps of the upper incisors in *C. stuhlmanni* is of some interest. In a series of three skulls from Ruanda the second and third incisors of one skull show distinct posterior cusps, whilst in the remaining two skulls cusps are scarcely traceable on these teeth. Also from Ruwenzori East, altitude 6000–10,000 feet, there is a series of four skulls with cuspless incisors, whilst from Ruwenzori West, altitude 7000 feet, another skull shows distinct posterior cusps on the second and third incisors, from which it would appear that these teeth are actually in the process of simplification through the suppression of the cusps, and that, as further material becomes available, we may expect to find a like process of simplification taking place in the teeth of the lower jaw, which would tend to throw some doubt upon the validity of the presence or otherwise of this talonid as a generic character.

The golden moles, however, are comparatively rarely collected, and many more specimens will be necessary before any satisfactory survey can be made of these little-known animals. Mr. Foster is to be congratulated upon discovering this new species upon Mt. Elgon, which is the most northerly locality from which such an animal has been collected.

## LXXXVII.—*Note on a Parasphenoid of* Conchopoma *from the Middle Coal Measures of Linton, Ohio.*

By MARGARET C. STEEN, Ph.D., Zoology Department, University College, London.

[Plate XXII.]

THE genus *Conchopoma* is represented by a single species, *Conchopoma gadiforme*, Kner, known only from the Lebach Shales, Saarbruck, where it is extremely rare. It is therefore of interest to record the occurrence of an isolated parasphenoid of *Conchopoma* in a cannel coal from the Middle Coal Measures of Linton, Ohio (no. R. 2661, Geol. Dept., Brit. Mus. Nat. Hist.).

This parasphenoid (Pl. XXII.) consists of a broad flat anterior plate, which is continued posteriorly as a slender shaft. The anterior plate is covered with close-set, round, heavy subconical teeth, except for a few smooth circular depressed areas, which appear to mark the presence of former teeth. Between the individual teeth and behind the anterior plate, the surface shows a reticulate ornament which does not extend on to the posterior shaft.

This parasphenoid is identical with those figured by Weitzel, and Watson and Gill. The Linton species of *Conchopoma*, therefore, is at least very closely allied, if not identical, with *Conchopoma gadiforme*, Kner. In this connection it is interesting to note that Romer considers *Peplorhina exanthematica* from Linton to be related to *Conchopoma*.

The occurrence of so specialized and rare a Dipnoan as *Conchopoma* in two localities so widely separated as Linton and Lebach extends considerably the range of the species, and carries back the history of the genus from Permian to Coal Measures times.

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### EXPLANATION OF PLATE XXII.

*Conchopoma* sp. (R. 2661). Parasphenoid, ×2·5.

## LXXXVIII.—*The Coleopterous Genus* Trichillum (*Copridæ*), *with a Key to the Species*. By GILBERT J. ARROW.

ONLY two species of these little beetles have yet been described, the typical form, *T. heydeni*, Har., occurring in Brazil, and *T. externepunctatum*, de Borre, in Colombia. Three others are known to me, which I have here described, adding a key to the distinctive features of all five. *Trichillum* is nearly related to the Old-World genus *Caccobius*, of which some species have similar scattered erect bristles. The obliteration of the ventral sutures in the middle is the most marked generic character.

I know *T. externepunctatum* only from the description.

The types of the three new species are in the British Museum.

### *Key to the Species of* Trichillum.

| | |
|---|---|
| Pronotum punctured at the sides only. | |
| The three inner elytral striæ not effaced anteriorly ...................... | *heydeni*, Har. |
| The three inner elytral striæ effaced anteriorly ...................... | *externepunctatum*, de Borre. |
| Pronotum entirely punctured. | |
| Clypeal teeth not widely separated .... | *hystrix*, sp. n. |
| Clypeal teeth widely separated. | |
| Clypeal teeth sharp ................ | *ohausi*, sp. n. |
| Clypeal teeth blunt ................ | *cristatum*, sp. n. |

### *Trichillum hystrix*, sp. n.

Nigrum vel nigro-piceum, pedibus rufis, antennis flavis; oblongo-ovale, convexum, corpore supra et subtus setis flavidis parum brevibus vestito, capite sat fortiter punctato, haud carinato, clypeo antice fortiter bidentato, dentibus approximatis, lateribus valde arcuatis; pronoto fortiter inæqualiter crebrius punctato, marginibus lateralibus valde arcuatis; elytris subtiliter striatis, intervallis punctis seriatis parum minutis aut sparsis instructis; pygidio sat fortiter inæqualiter punctato; corporis subtus lateribus punctato-rugosis, metasterni medio lævi, late impresso, abdominis medio fortiter punctato.

Long. 3·5–4 mm., lat. 2·5 mm.

ARGENTINA: La Noria, R. San Javier, Santa Fé (*G. E. Bryant*, Dec.).

The form is a little more elongate and the bristly clothing more conspicuous than in the other species. In addition, the head is differently shaped, the sides of the clypeus and ocular lobes are separately rounded and not continuous, and the two clypeal teeth are strong and not far apart. The clypeus is not separated by ridge or suture from the forehead. The pronotum is entirely and fairly strongly punctured, with large and small punctures intermixed. The broadly oval smooth depression in the middle of the metasternum is another very distinctive feature of the species.

### *Trichillum ohausi*, sp. n.

Cupreo-nigrum, nitidum, tibiis, tarsis antennisque rufis; breviter ovatum, convexum, corpore supra et subtus setis minutis pallidis parce instructo; capite ubique haud grosse punctato, clypeo antice dentibus duobus acutis sat remotis armato, a fronte carina transversa diviso; pronoto ubique punctato, punctis dorso minutis sat sparsis, lateribus fortioribus et crebrioribus; elytris subtiliter striatis, intervallis antice fere impunctatis, postice punctis minutis setiferis seriatis parce instructis; pygidio punctis setiferis parce instructo; metasterno parce punctato, medio lævi; abdomine grosse punctato.

Long. 3·5–4·5 mm., lat. 2·5–3 mm.

Ecuador: Loja Punzara, Calvario, 6600 ft. (*F. Ohaus*, Aug.); Piscobamba (*M. Witt*).

Taken in considerable numbers by Dr. Ohaus.

This is similar in size and general appearance to the type-species *T. heydeni*, Har., but, in addition to its feebly metallic colour, is easily distinguished from that species by the sharp, widely separated teeth of the clypeus and the more uniformly punctured head and thorax. The clypeus is separated from the forehead by a rather sharp, straight carina, and both are fairly closely punctured, without large interspersed pits as in the other species. The pronotum also is without large interspersed punctures, and is finely punctured upon the disc and more strongly at the sides.

### *Trichillum cristatum*, sp. n.

Obscure cupreum, nitidum, antennis tarsisque rufis; ovatum, convexum, corpore supra et subtus setis pallidis sat brevibus instructo; capite transversim carinato, parce punctato, lateribus trisinuatis, clypeo obtuse bidentato, dentibus brevibus, remotis, fronte paulo crebrius inæqualiter punctato; pronoto ubique fortiter punctato, punctis minutis intermixtis, marginibus lateralibus valde arcuatis; elytris striatis, intervallis punctis setiferis parum minutis biseriatim instructis; pygidio parce et minuto punctato; metasterni medio lævi, lateribus rugosis, abdomine subtus grosse punctato.

Long. 4·5–5 mm., lat. 3 mm.

Ecuador: Loja, 6600 ft. (*F. Ohaus*, Sept.); Piscobamba (*M. Witt*).

This was found by Dr. Ohaus upon the hills clothed with bushes, just above the town of Loja. It will be easily recognized by its rather larger size, the widely separated and rather blunt clypeal teeth, and the strong transverse elevation upon the head. The pronotum is completely punctured, and the elytral intervals bear imperfect double rows of setæ. It is of a brighter metallic colour than the other species.

## LXXXIX.—*Two new Species of Lamellicorn Beetles belonging to the Genus* Peltonotus. By GILBERT J. ARROW.

IN 1910 (Ann. & Mag. Nat. Hist. (8) v. p. 153) I described four additional species of this genus, which previously contained only one. None have been added since that date, but I have now to record two more, bringing the total to seven. The genus is a peculiar one, and nothing is known as to the habits of its members. Two species have been found in abundance in the Indo-Chinese Peninsula, and the genus ranges as far north as Assam and as far south as Borneo. The discovery of a species in the Philippine Islands extends its known range eastwards. This species, *E. philippinus*, is of peculiar interest, because, although its close relationship to the others is indisputable, it has not the extruded labrum which is one of their most marked characteristics. As I have pointed out, the genus *Peltonotus* is an intermediate one, having affinities with the Rutelinæ and Dynastinæ. It would be quite justifiable to form a new genus for the Philippine insect, but it would then be difficult to avoid referring this to the Dynastinæ, whereas *Peltonotus* falls most naturally amongst the Rutelinæ. Such a separation would do violence to a close affinity, and, in view of the fact that only the male of the species is yet known, it seems to me better, for the present at least, to regard this interesting form as congeneric with the rest.

The types of the new species are in the British Museum.

### *Peltonotus philippinus*, sp. n.

Niger, nitidus, elytris pygidioque opacis, corpore subtus parce rufo-hirsuto; ovalis, modice convexus, pedibus sat robustis; capite fortiter punctato, vertice lævi, clypei margine antico recto, reflexo, labrum obtegenti; pronoto parce punctato, toto marginato, lateribus medio obtuse angulato, antice convergentibus, postice fere parallelis, rectis, angulis posticis paulo obtusis, bene indicatis, basi subtiliter arcuato; scutello lato, lævi; elytris modice crebre ac fortiter punctatis, punctis partim seriatis;

propygidio et pygidio minute coriaceis atque setosis, opacis; metasterni medio lævi, sulcato, lateribus rugose punctatis:
♂, tibiis anticis acute tridentatis, tarsis incrassatis, articulo ultimo permagno, unguibus longis, majori apice minutissime fisso.
Long. 24 mm., lat. 13 mm.

Philippine Is.: Mt. Makiling, Laguna (*F. C. Hadden*, May).

The body is more compact than in the other species, the base of the prothorax more closely fitted to the elytra and the hind angles well marked. The upper surface is without hair, the pygidium and propygidium have a clothing of exceedingly minute bristles, and the clothing of the lower surface is rather short and scanty. Although this resembles *P. pruinosus* in its shining black head and thorax and dull sooty elytra, it is much larger than any other known species of the genus, and differs by its completely margined pronotum and the important fact that the labrum is not extruded. This makes still more apparent the intermediate position of the genus between the Rutelinæ and Dynastinæ and the difficulty of separating those two groups.

### *Peltonotus similis*, sp. n.

Niger, nitidus, elytris paulo opacis (♂) vel sericeis (♀), pedibus corporeque subtus parum longe flavo-hirsutis; clypeo minute, sat crebre punctato, lato, margine recto, fronte minus crebre punctato; pronoto medio subtiliter, lateribus fortius punctato, basi leviter arcuato, utrinque leviter impresso; singulo elytro striis geminatis tribus instructo, intervallis irregulariter punctatis:
♂, pronoto sat angusto, elytris subopacis, setis minutissimis sparsutis; pygidio opaco, minutissime setoso:
♀, pronoto lato, elytris leviter sericeis, fortius punctatis, postice latis; pygidio nitido, fortiter punctato.
Long. 15–17 mm., lat. 8·5 mm.

British North Borneo: Mt. Kinabalu.

This is closely related to *P. malayensis*, Arr., also found in Borneo. The male of that species is unknown, but the females are easily distinguishable by the absence in *P. similis* of the lateral prominence seen towards the extremity of the elytra in the other form. The elytra are short and gradually dilate towards the extremities without impression behind the shoulder as in *P. pruinosus*. The sides of the pronotum are more strongly punctured and those of the elytra rather more finely and closely than in *P. malayensis*. The elytra have a slight iridescent bloom, as in the same sex of *P. malayensis*, but those of the male are almost opaque and bear, especially towards the end, extremely minute setæ in the punctures. Similar setæ are present also upon the pygidium in this sex. The labrum is strongly bilobed.

## XC.—*A Bibliographical Note on a Copy of Wiedemann's 'Diptera Exotica,'* 1820–1821. By H. W. ENGLAND (Clerk in charge of the Zoological Library).

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THE British Museum (Natural History) has lately acquired a copy of Wiedemann's 'Diptera Exotica,' Kiliae, 1820–1821, in two parts, and as the second part of this copy is apparently different from the one described by Mr. C. W. Johnson in 'Psyche,' vol. xxxviii. no. 1, 1931, pp. 25–26, I think it desirable to give a description and the collation of both parts.

[Pt. 1] DIPTERA EXOTICA.

Sectio I. antennis multiarticulatis.

Munus Decani Fac. Med. deponens
edidit
Dr. C. R. G. Wiedemann.

Kiliae 1820.

pp. i–xix. Prooemium ; [Half Title] Dipterorum exoticorum Sectio I. antennis multiarticulatis; pp. 1–38. (Signatures 1–$2^8$, $4^3$.)

[Pt. 2] DIPTERA EXOTICA.

Sectio II. antennis parumarticulatis.

Magistratum
in Academia Christiana Albertina abdicans
edidit
Dr. C. R. G. Wiedemann.

Kiliae 1821.

pp. i–iv [Prooemium]; pp. 43–44 Supplementum ad sectionem I.; pp. 45–50, 1–101. (Signatures [p. 1] 1–$6^8$, $7^3$). Two loose plates (1 & 2) accompany this part.

Mr. Johnson does not mention that the pagination is not continuous in his copy, and according to his description our copy wants the titlepage to the two parts as a whole, and which is apparently identical with that usual in the 1821 copies. There can be no doubt that Sectio I. was published in 1820, and Sectio II. in 1821, and probably the whole was reissued with considerable additions, in one volume, late in 1821. We have a copy of this, which I believe to be a "second enlarged edition." It is made up as follows:—

[Titlepage.] C. R. G. WIEDEMANNI
[Ed. 2] Med. Doctoris, in Acad. Kiliensi
Prof. Med. P. O.

DIPTERA EXOTICA.

Pars I.

Tabulis aeneis duabus.

Kiliae 1821.

pp. i–xix Prooemium; [Half Title] (as in Sectio I., 1820); pp. 1–38 (signatures 1–$2^8$, $1^3$); pp. 39–42 [taking the place of pp. i–iv of Sectio II.]; 1 text-fig. on p. 40; pp. 43–44 Supplementum ad sectionem I.; pp. 45–244. (signatures [p. 51] 4–$15^8$, $16^1$.); plates 1 & 2.

In this copy pages i–xix and 1–38 are printed and numbered exactly as in Sectio I. [1820], then follow 39–42 [wanting in our copy of Sectio II., and doubtful if published with that edition], 43–151 [which equals 43–50 and 1–101 of Sectio II.], 152–244, and plates 1 & 2.

On pages 39–42 the author has redescribed a number of Fabrician species and describes some new species. These are omitted from the earlier issue, where the four pages of the Prooemium are found instead.

Mr. Johnson states:—"It is very evident that . . . probably pages 39–42 and the supplement to Section I, pages 43–44, were published in 1820 and not in 1821," but this does not agree with our copy, which ends at p. 38 and is dated 1820. Thus it is much more probable that pages 39–42 and the supplement to Sectio I. "pp. 43–44" were published in 1821, see p. 39, which commences:—"Postquam sectio prima typis fuerit excusa," and that only pages 1–38 with the xix pages of the Prooemium were published in 1820. This is indeed evidenced from the copy of Sectio I. now in the Museum's possession, which bears the date of 1820 as stated above. A reference to this work will be found in:—Horn, W., and Schenkling, S., Index Litteraturae Entomologicae, ser. i. Bd. iv. 1929, p. 1334, No. 43, which reads: "Diptera Exotica. Kiliae, 1821. 8°. Pars 1. 19 u. 244 p., 2 Taf. mit je 8 Fig.—Heft 1 bis p. 42 mit Jahreszahl 1820 auf dem Umschlag."

That there was a second "enlarged" edition of the whole work seems probable from the following:—

(1) The substitution of pp. 39–42 [in ed. 2] for the former preface [Prooemium pp. i–iv].
(2) The renumbering of the pages and sheet signatures.
(3) The addition of 93 pages of text.
(4) Such minor details as the substitution of "Thereva abdominali" for "abdominalis" on p. 113 (=p. 63 in the "first edition"), *and* the correction of "Tribus ignoti" to "ignotae" on p. 150 (=p. 100 in the "first edition").

## XCI.—*Note on the Identity of Two Species of the Genus* Calliphora (*Diptera*). By Daphne Aubertin, M.Sc., F.L.S.

While studying the Oriental species of the genus *Calliphora* my attention was drawn to an apparent misuse of the name "*aucta*," Walk. The only specimen under this name in the British Museum Collection agrees very well with Walker's description of *Musca aucta* (Ins. Saund. p. 334, 1856), and may be regarded as the type. It is an undersized, rather lightly chitinized female in extremely poor condition, and, as far as it can be recognized at all, it appears to me to be a specimen of *C. erythrocephala*, Mg., on account of the reddish parafacials and broad frons. Whatever its actual identity, it is certainly distinct from the species referred to by Patton (Bull. Ent. Res. xiii. p. 113, 1922) as common in India, under the name *C. aucta*, Walk. I have seen two males of Patton's species from the Brunetti collection and a female from the Senior-White collection; the latter is certainly not conspecific with Walker's type. I therefore propose to treat these specimens as representing a new species.

### *Calliphora pattoni*, sp. n.

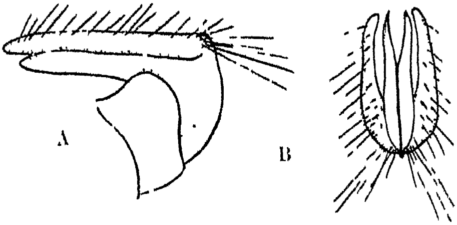
*Head.*—Eyes, in ♂, separated at point of closest approximation by ½ width of third antennal segment, in ♀ by slightly less than ⅓ width of head as seen from the vertex. Frons, parafrontals, parafacials, and jowls dark greyish black, the epistome and facial ridges slightly reddish. In certain lights silver flecks visible below ocellarium, opposite point of insertion of antennæ, and in middle of parafacials. Antennæ dark brown, third segment rufous at base; palpi orange; jowls and post-buccæ* covered with black hair.

---

* Area at base of head behind jowls.

*Thorax.*—Dull, silver-dusted; four narrow black longitudinal stripes anteriorly; acr. 2+3, dc. 2+3, a presutural bristle present.

*Abdomen.*—Metallic blue-green with irregular silver dusting; sternites rather hairy in ♂; hypopygium inconspicuous; ♂ gentalia as in the figure, the paralobes being less highly chitinized than the mesolobe.



Genitalia of *Calliphora pattoni*, ×25.
A and B, lateral and dorsal views of forceps.

*Wings.*—Hyaline, slightly darkened at base, along submarginal cell, and at small cross-vein; basicostal scale black; subcostal sclerite covered with soft tawny pubescence; squama dark brown, the lower lobe white-rimmed in certain lights.

*Legs.*—Black.

*Distribution.*—India: Darjiling, Kashmir, Himalaya region, Khasia Hills.

*Biology.*—According to Senior-White (Mem. Dept. Agr. Ind. vii. p. 99, 1922) this species is larviporous.

♂ type and one paratype in British Museum; ♀ type in Senior-White collection.

## *Musca lilæa*, Walker.

Hough (Zool. Bull. ii. p. 287, 1889) records this species as a synonym of *Calliphora erythrocephala*, Mg., and the synonymy is repeated by Senior-White (Rec. Ind. Mus. xxviii. p. 129, 1926). The type of *Musca lilæa*, Walk. (List Dipt. Brit. Mus. iv. p. 894, 1849), is a female of Hough's species, *Calliphora latifrons* (Bull. Zool. ii. p. 286, 1899); this name must therefore be abandoned in favour of Walker's.

*Musca ilerda*, Walk. (List Dipt. Brit. Mus. iv. p. 895, 1849), is also a synonym of this species, which, incidentally, is the genotype of *Eucalliphora*, Tns. (Smiths. Misc. Coll. li. p. 118, 1908).

British Museum (Natural History),
South Kensington.

## XCII.—*Oxford University Greenland Expedition*, 1928.—*Diptera Nematocera.* By F. W. EDWARDS, M.A., Sc.D., F.E.S.

THE great majority of the Nematocerous Diptera collected by Major R. W. G. Hingston were taken at Kugssuk, 30 feet, in the Godthaab Fjord, West Greenland; relatively few at Matuola, 2000 feet, in the same fjord. Where no locality is mentioned Kugssuk is to be understood.

The Nematocera of Greenland were reviewed by Lundbeck in 1898 (Vid. Medd. 1898, p. 236), since when no important work has been published apart from a few isolated records. The number of species noted by Lundbeck was as follows:—Scatopsidæ, 1; Simuliidæ, 2; Cecidomyiidæ, 1; Sciarinæ, 16; Mycetophilidæ (excluding Sciarinæ), 11; Tipulidæ (including 3 *Trichocera*), 11; Chironomidæ, 38; Ceratopogonidæ, 3; Culicidæ, 1.

Nearly all the larger species were recognized as having a wide distribution, especially in Arctic America, but many of the smaller forms were described as new and have not yet been recognized elsewhere; this is no doubt owing to the insufficiency of our knowledge of the subject, and does not indicate any appreciable degree of endemism among Greenland Nematocera. As in other northern countries the Chironomidæ are dominant.

The small collection brought back by the Oxford University Expedition included examples of only 19 species, and only one of these was definitely not recorded in Lundbeck's list. This species, *Helobia hybrida*, Mg., has an extremely wide distribution throughout the temperate regions of the Northern Hemisphere. The list of all 19 species, with nomenclature revised, is as follows:—

### Mycetophilidæ.

*Boletina grœnlandica*, Staeg. 5 ♂, 1–19. vii.; 13 ♀, 21. vi.–25. vii. All in willow-scrub except 1 ♂ ? habitat.

*Exechia frigida*, Holmgr. (?*fungorum*, DeG., of Lundbeck). 1 ♂, 11. vii., willow-scrub.

*Phronia* sp. 2 ♀, 27. vi., willow-scrub.

*Mycetophila fungorum*, DeG. (*punctata*, Mg.). 1 ♂, 19. vii., willow-scrub; 1 ♂, 25. vi., ? habitat.

*Sciara* sp. 1 ♂, 10. vii., willow-scrub; 1 ♀, 1. vii., on heath; 1 ♀, 17. vii., ? habitat.

Other examples, probably of the same species, were bred from humus by C. G. Trapnell. One imago and a larva are in the collection.

### Simuliidæ.

*Simulium vittatum*, Zett. 1 ♂, 28. vi., ? habitat; 1 ♂, 19. vii., willow-scrub; 8 ♀, 19, 20. vi., heath; 25 ♀, 20. vi., willow-scrub; 4 ♀, 19. vii., willow-scrub.
Matuola, 2000 feet: 3 ♀, 6, 7. vii., heath.

*Simulium arcticum*, Mall. (? *reptans*, L., of Lundbeck). 1 ♀, 17. vii., ? habitat.
Matuola: 1 ♀, 7. vii., heath.

### Culicidæ.

*Aëdes nigripes*, Zett. 5 ♀, 20. vi., heath; 9 ♀, 24. vi.–1. viii., willow-scrub (8), ? habitat (1).
Matuola: 1 ♀, 6. vii., willow-scrub.

### Chironomidæ.

*Pentaneura pulchripennis*, Lbk. (*Tanypus*). 1 ♂, 4. vii.; 1 ♂, 27. vii., willow-scrub; 1 ♀, 25. vii., ? habitat.
Matuola: 5 ♀, 6. vii., heath.

*Anatopynia pictipennis*, Zett. (*Tanypus*). 2 ♂, 28. vi., willow-scrub.

*Procladius crassinervis*, Zett. (*Tanypus*). 1 ♀, 27. vi., ? habitat.

*Spaniotoma* (*Trichocladius*) *vitripennis*, Mg. (*variabilis*, Staeg.). 1 ♂, 27. vi.; 3 ♂, 3. vii., willow-scrub; 4 ♀, 3. vii., willow-scrub.
Matuola: 3 ♀, 6. vii., heath.

*Spaniotoma* (*Psectrocladius*) ? *limbatellus*, Holmgr. 32 ♂, 7 ♀, 1–27. vii., willow-scrub except 3 ♂ ? habitat.

*Spaniotoma* (*Orthocladius*) sp. 1 ♂, 4. vii., willow-scrub.

*Chironomus* ? *hyperboreus*, Staeg. 4 ♂, 1–25. vii., on willow-stems; 4 ♀, 24. vi., willow-scrub; 10 ♀, 30. vi.–30. vii., willow-stems.

*Chironomus* cf. *riparius*, Mg. 6 ♂, 8 ♀, 28. vi.–12. vii., willow-scrub; 1 ♀, 19. vii., on willow-stem.
Matuola: 1 ♂, 7. vii., willow-scrub.

### Trichoceridæ.

*Trichocera* sp. Matuola: 1 ♀, 7. vii., willow-scrub.

### Tipulidæ.

*Helobia hybrida*, Mg. 1 ♀, 24. vi., heath.
Matuola: 2 ♀, 6. vii., heath.

*Tipula arctica*, Curt. 4 ♂, 19. vi.–12. vii., heath; 9 ♀, 20. vi.–19. vii., heath.
Matuola: 1 ♀, 7. vii., heath.

## BIBLIOGRAPHICAL NOTICE.

CASEY A. WOOD. *An Introduction to the Literature of Vertebrate Zoology.* Pp. xix+643. 4to. Oxford University Press, 1931.

MORE than two-thirds of this book is a catalogue of titles relating to Vertebrate Zoology in the libraries of the McGill University. These are arranged in alphabetical order, and in general follow the usual plan of a library catalogue; there are, however, some traps for the unwary. Finding the Catalogue of Birds under Sharpe, the reviewer concluded that Boulenger's of African Freshwater Fishes and Woodward's of Fossil Fishes were not in the McGill libraries, until he discovered them entered under British Museum (Natural History).

The works of an author, including those written in collaboration, are listed in chronological order, without any indication that a change-back has been made from joint to single authorship. Until one has got used to this system it looks as though R. Bowdler Sharpe, for example, wrote by himself from 1868 to 1881, and from then to 1910 only in collaboration with others. When the first entry under a name is of a work written in collaboration this method is particularly misleading; Woodward and Sherborn appear to be joint authors of A. S. Woodward's 'Outlines of Vertebrate Palæontology' and of other works by Woodward. 'Living Animals of the World' is for some reason entered as "anonymous," although elsewhere in the book it is described as by E. G. Boulenger, Pycraft, and others. The labour of compiling the catalogue must have been considerable, and in spite of certain defects it is a useful synopsis of the contents of the McGill libraries in relation to the subject.

The Index to Author-titles is divided into sections, according to classes and localities; within the sections the entries are in chronological order.

The rest of the book is a review of the literature, which suffers from the absence of any mention of papers published in journals, or in the Proceedings and Transactions of Societies. There are a number of chapters on such subjects as Travels and Expeditions, Zoological Treatises in the Nineteenth Century, Ornithological and Mammalogical Monographs, etc. In general, these are not well arranged, and they reveal a lack of discrimination, some works of little importance receiving not only mention, but even commendation. The most interesting chapters are on the early history of the subject and on rare books.

The author admits that he is not altogether satisfied with the work, and that it is necessarily an incomplete presentation of the subject. We are inclined to think that a satisfactory review of the literature of Vertebrate Zoology, even although it be confined to separate works in the McGill libraries, is more than one man can hope to accomplish. C. T. R.

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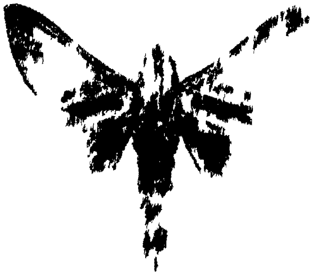

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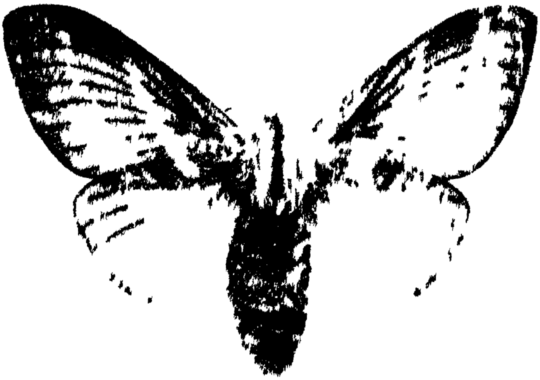

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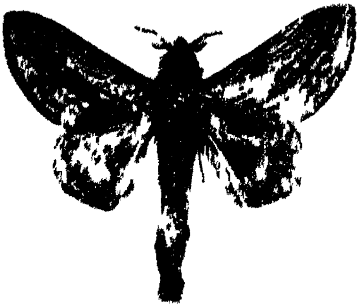

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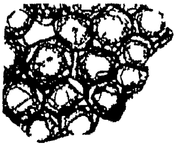

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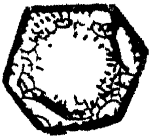

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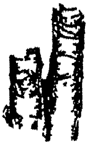

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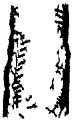

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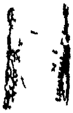

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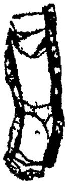

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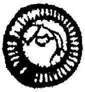

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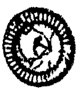

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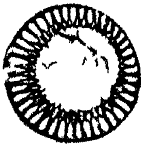

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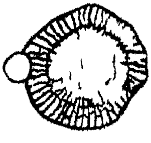

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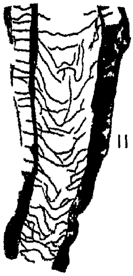

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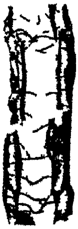

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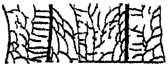

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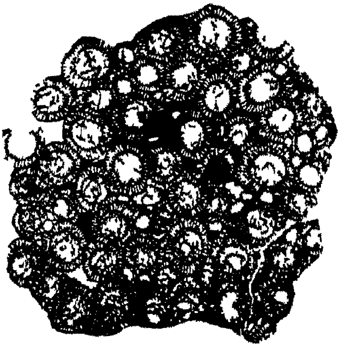

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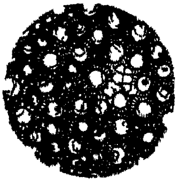

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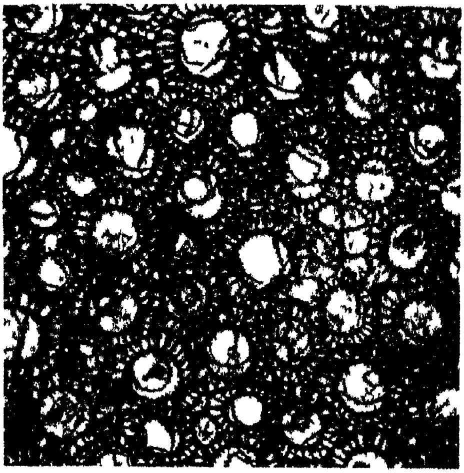

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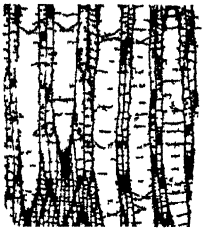

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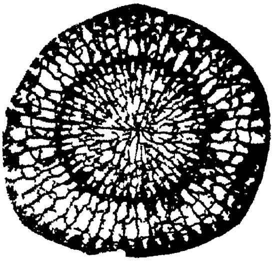
XIPHELASMA TUBULATUM (Schlotheim), ACERVULARIA CAESPITOSA (Hall), A CONGLOMERATA (Wedekind), A ANANAS (Linnaeus), and A BREVISEPTATA, Weissermel



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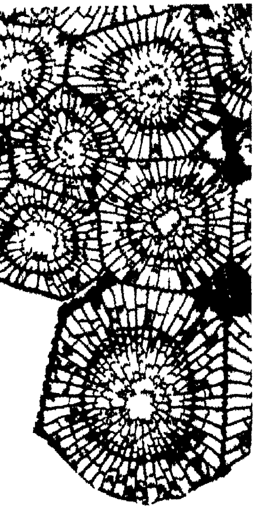

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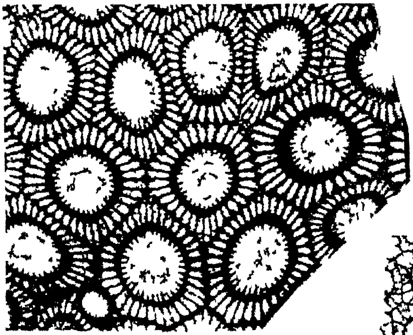

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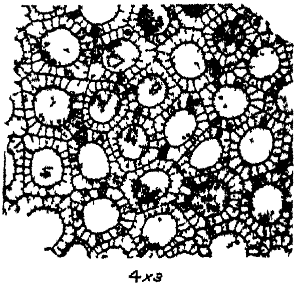

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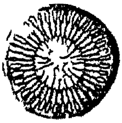

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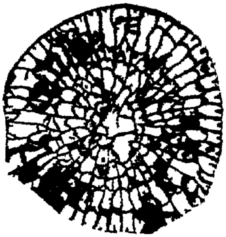

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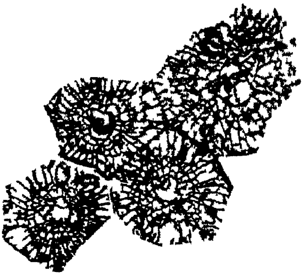

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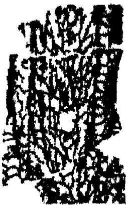

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ACERVULARIA ANANAS, var TRUNCATA (Wahlenberg),
A ANANAS, var SINGULARIS, Lang & Smith,
A BREVISEPTATA, Weissermel, A DENSA, sp n,
and A EXIGUA, sp n

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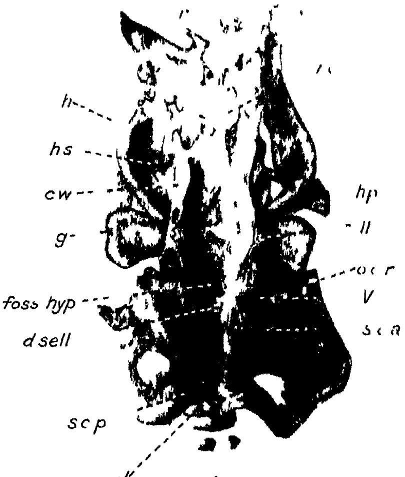

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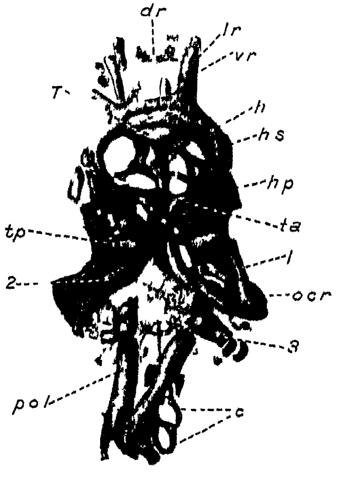

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**PALÆOSPONDYLUS GUNNI, TRAQUAIR**

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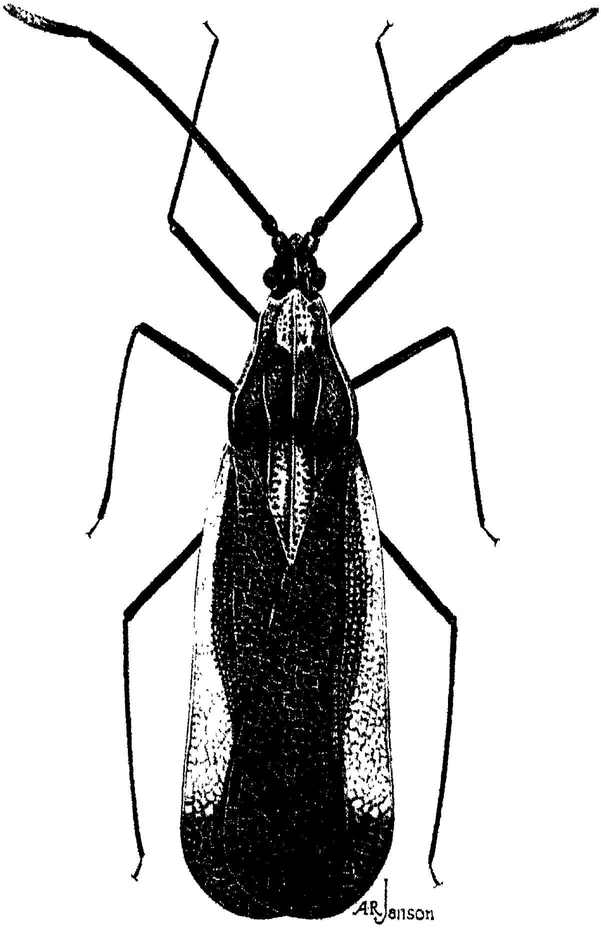

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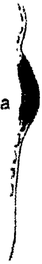

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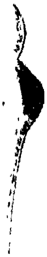
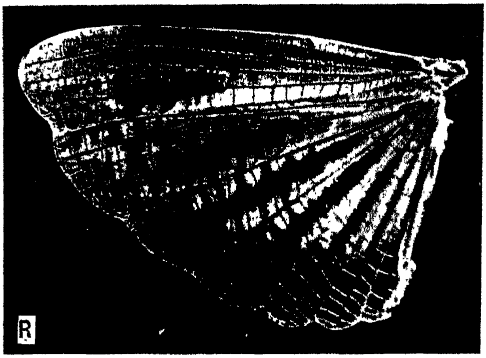


2.

Fig. 1. TELEONEMIA DISPERSA, sp. n.
Fig. 1a. MEDIAN CARINA OF T. DISPERSA, sp. n.
Fig. 2. MEDIAN CARINA OF T. ALBOMARGINATA, CHAMP.

FIG. 1.



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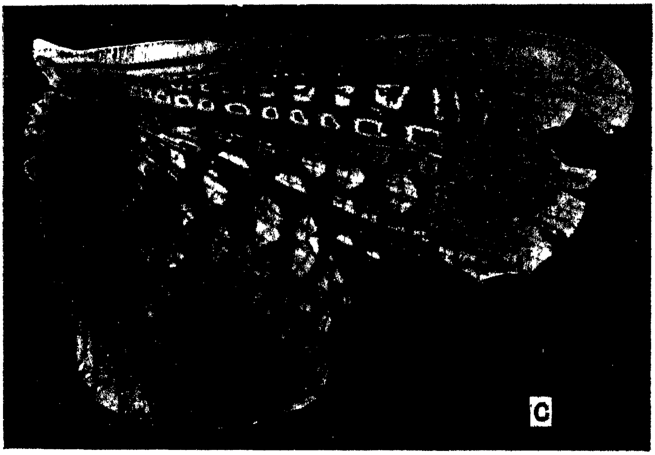
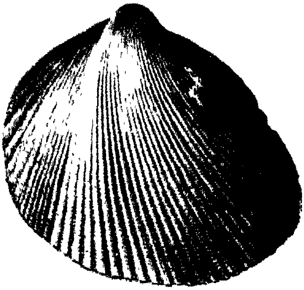


New Forms of Iris (Mantidæ).



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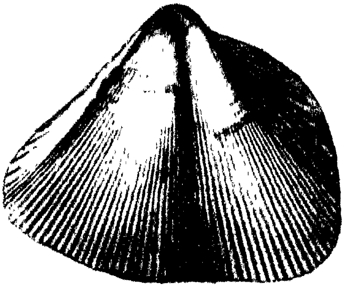

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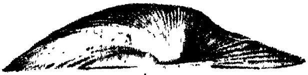

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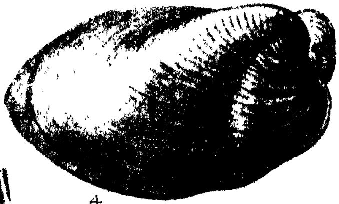

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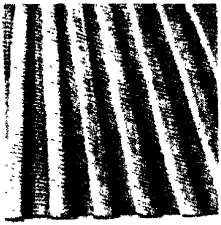

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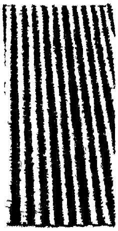

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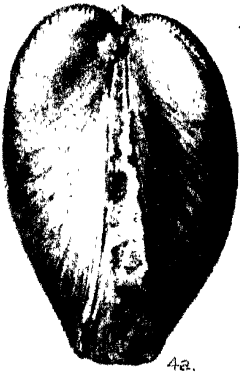

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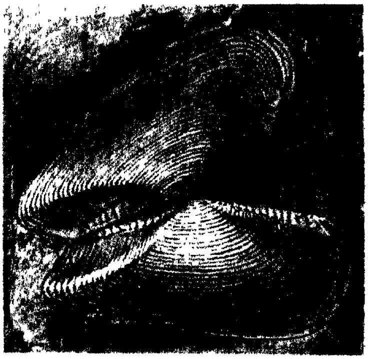

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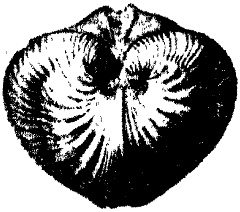

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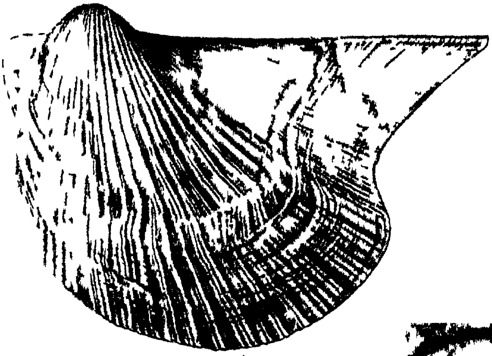
E.T. Talbot, del.

NEW SILURIAN LAMELLIBRANCHS FROM LUDLOW



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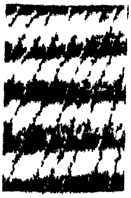

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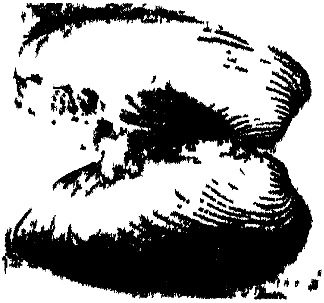

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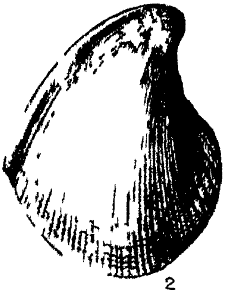

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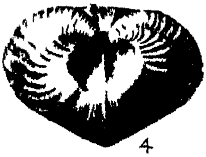

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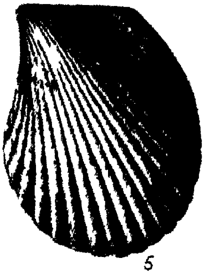

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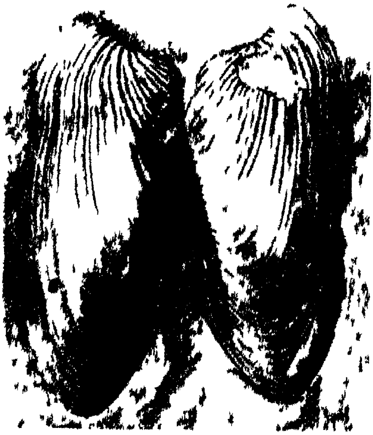

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E T Talbot del

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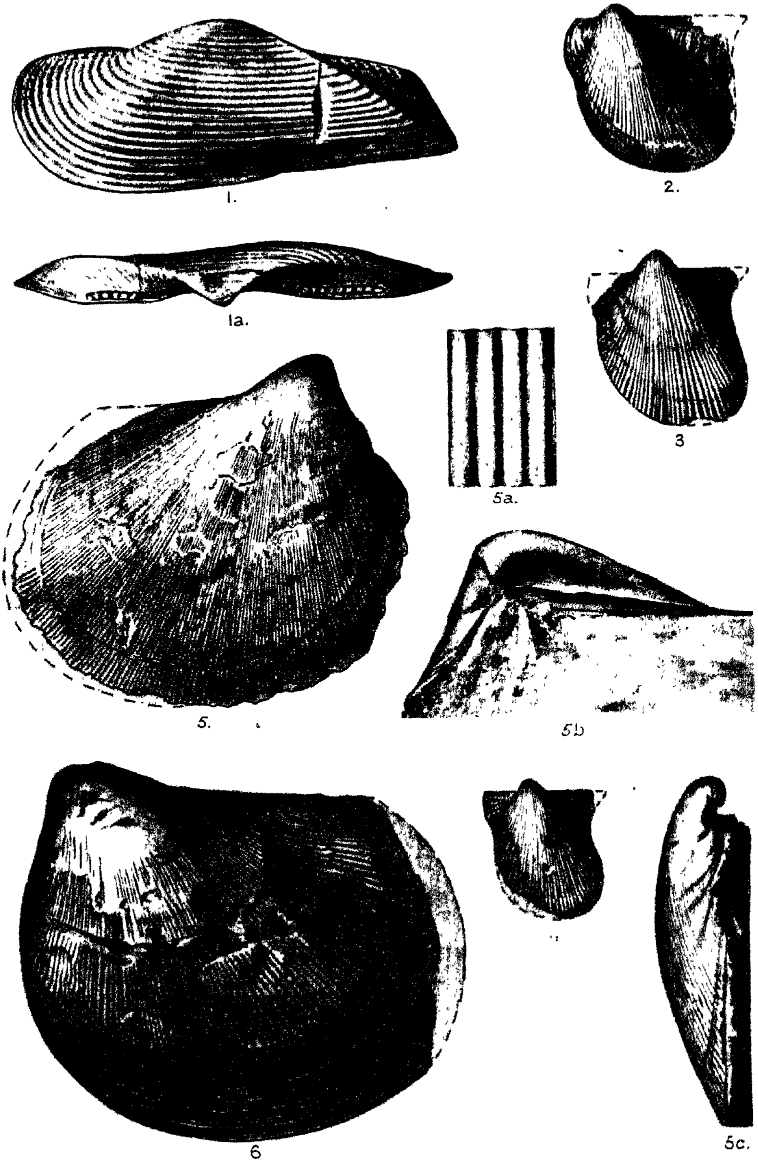

E.T. Talbot, del.

NEW SILURIAN LAMELLIBRANCHS FROM LUDLOW.

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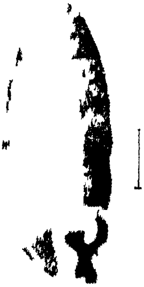

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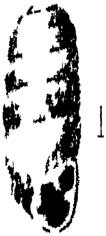

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AFRICAN MOLLUSCA

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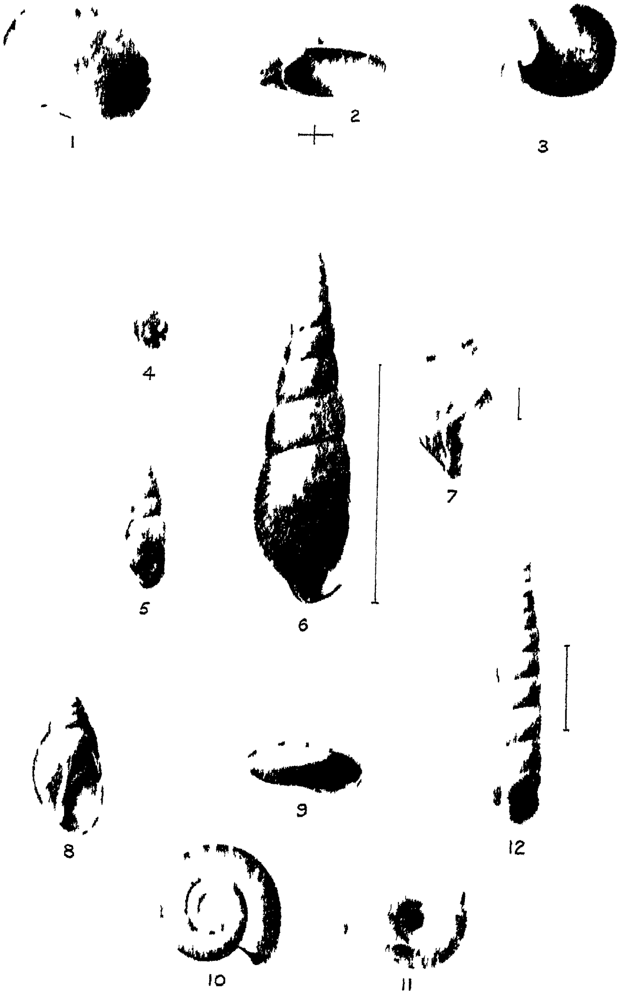

G M Woodward

AFRICAN MOLLUSCA

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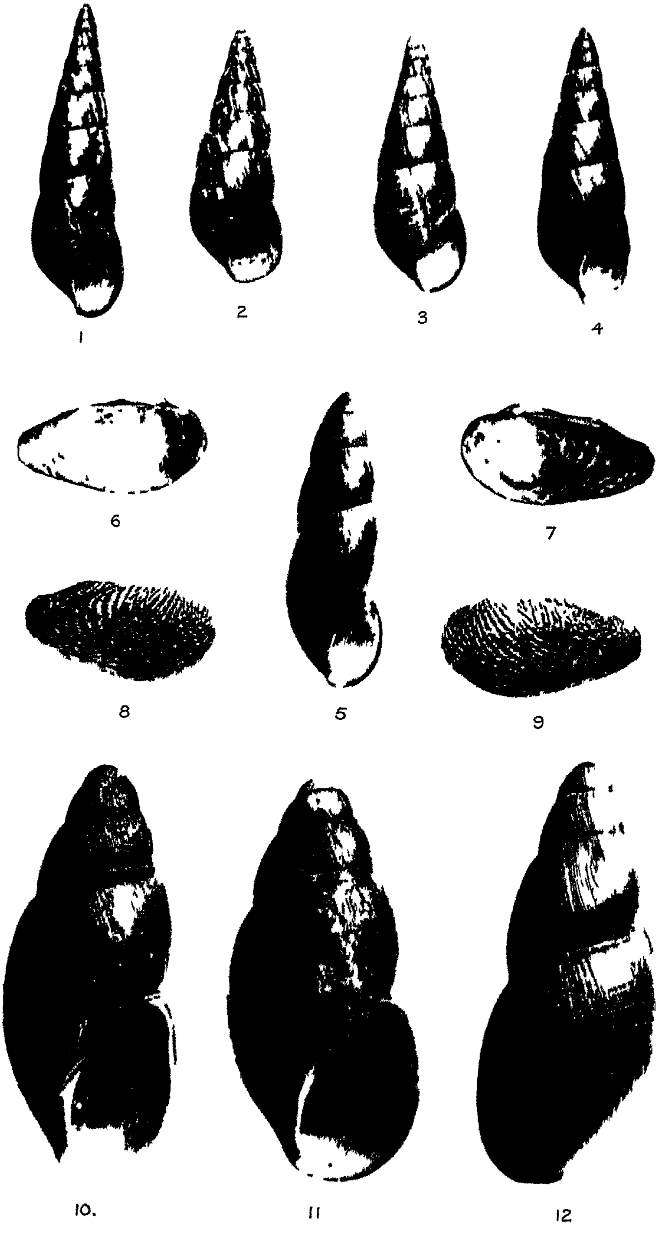

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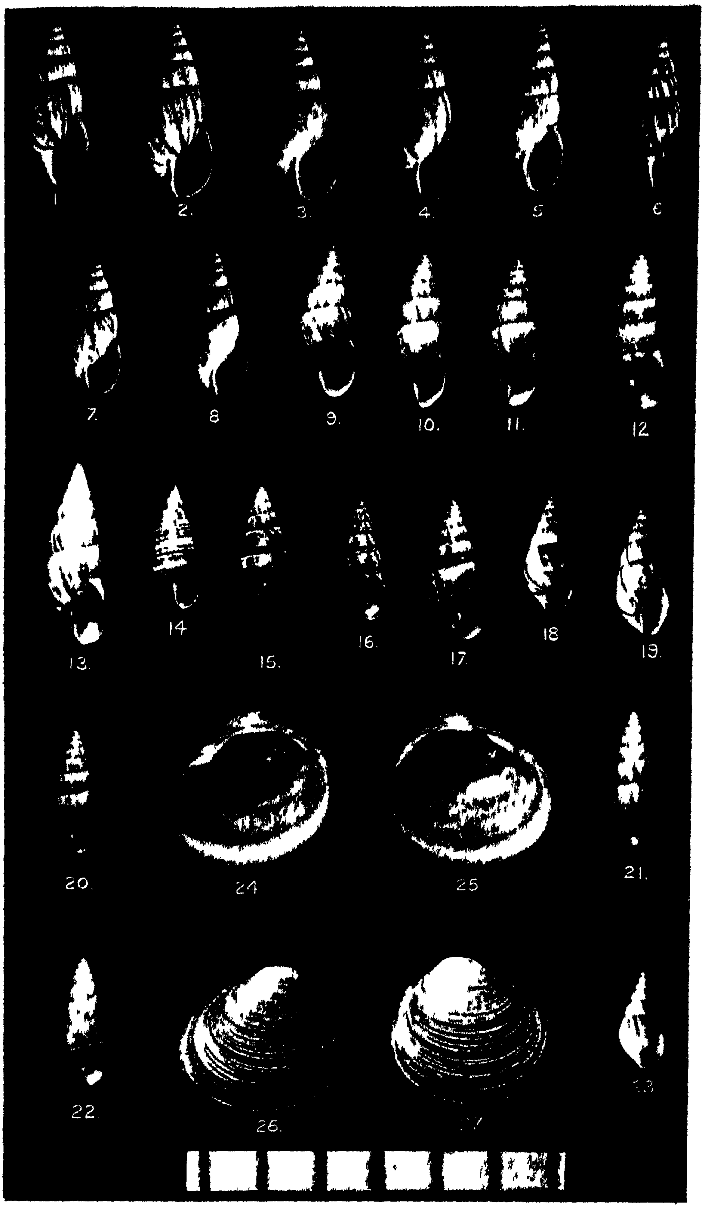

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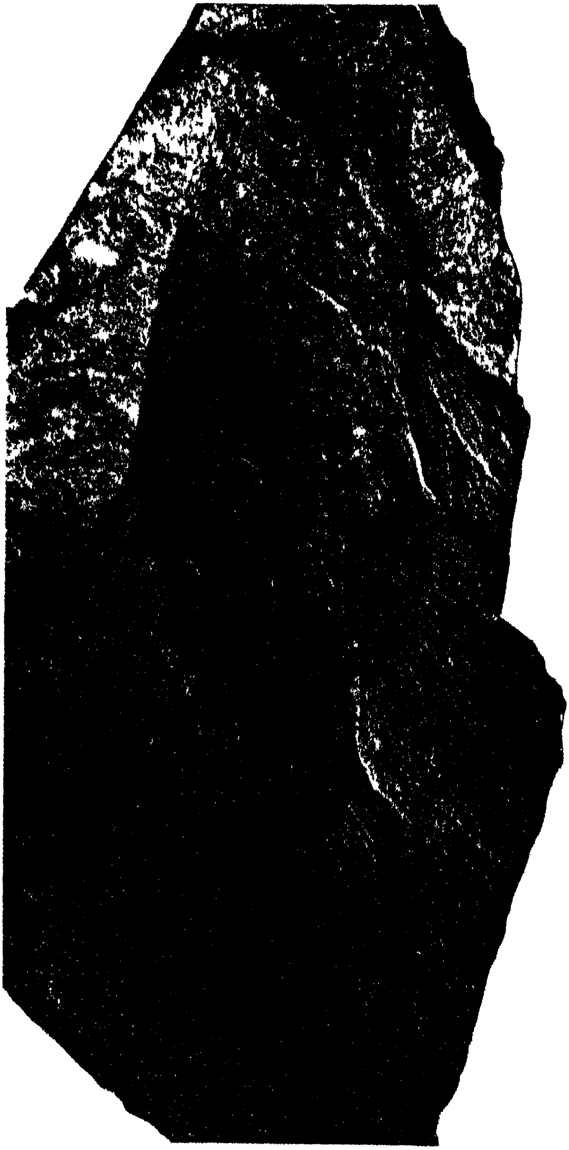
SMITH WOODWARD. Ann. & Mag. Nat. Hist. S. 10. Vol. VIII Pl XIV



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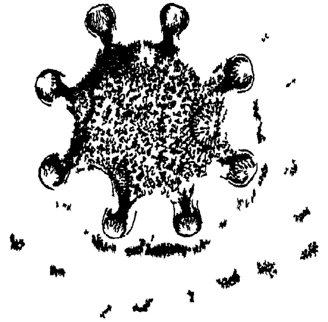

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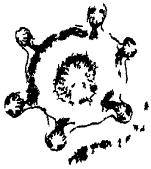

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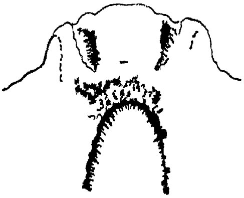

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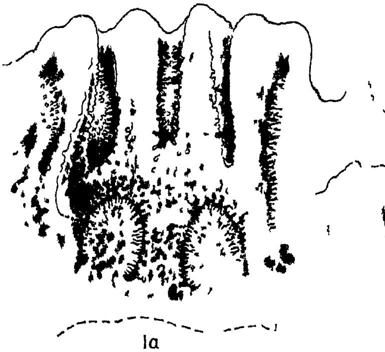

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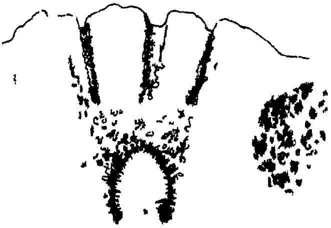

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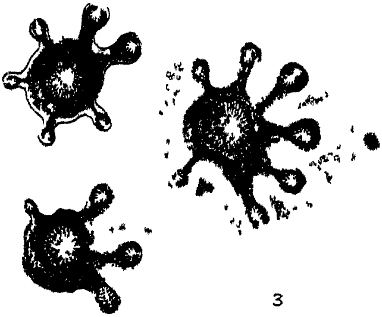

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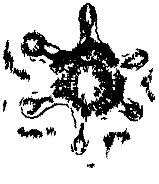

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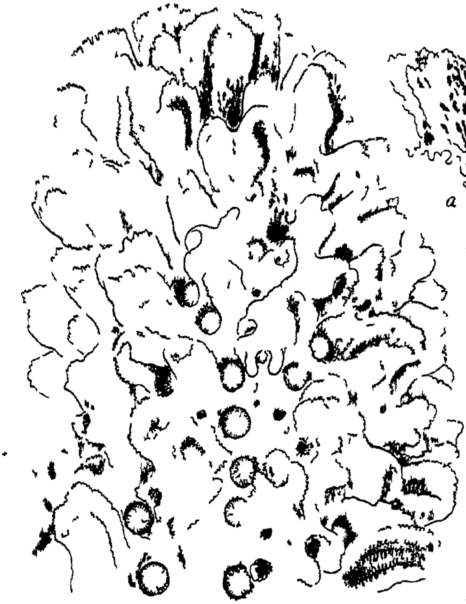
CALIFORNIAN HYDROCORALS



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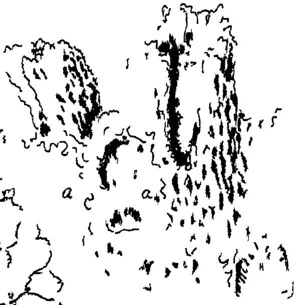

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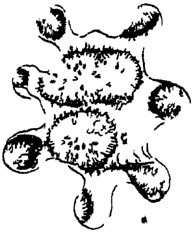

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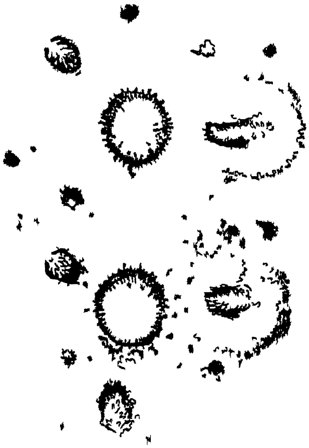

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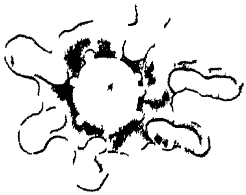

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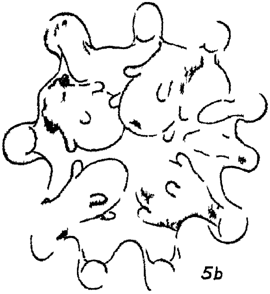

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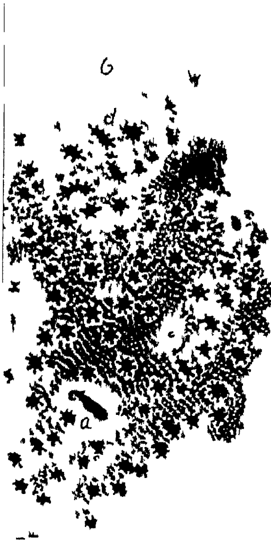

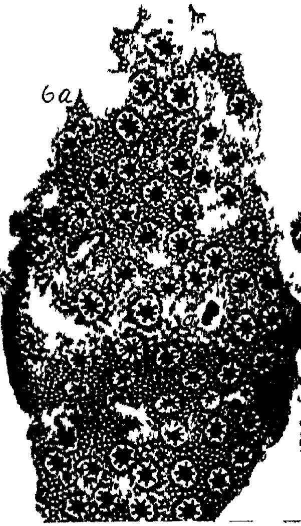

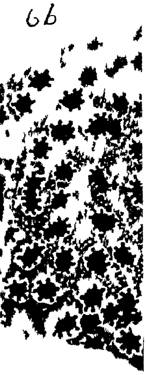

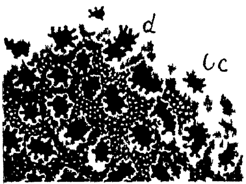

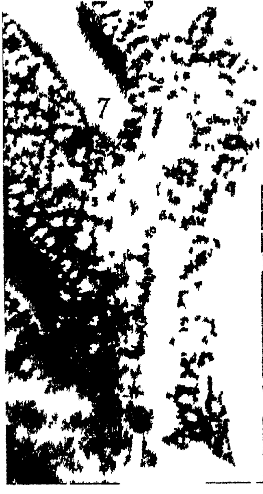

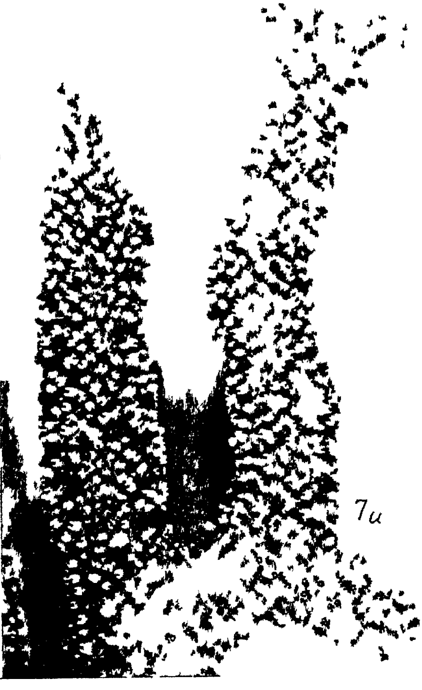

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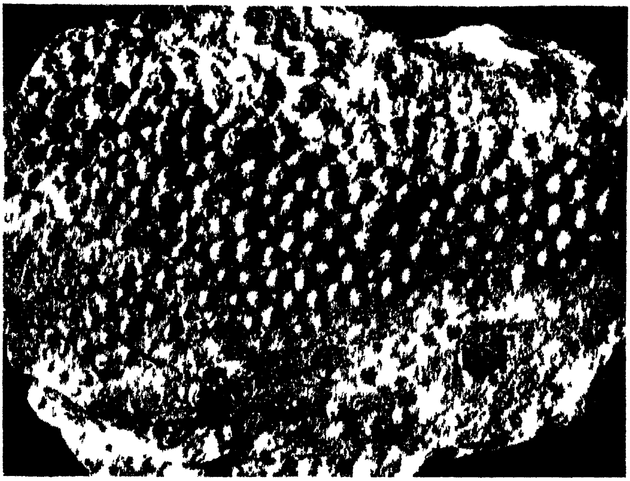

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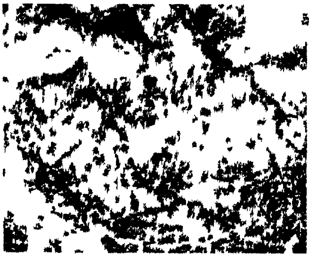

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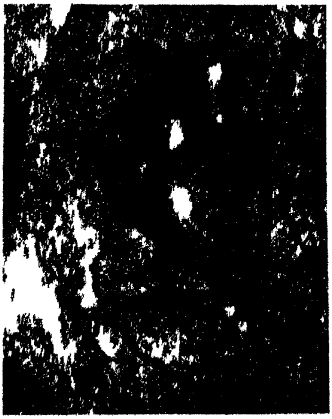

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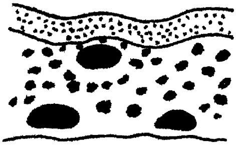

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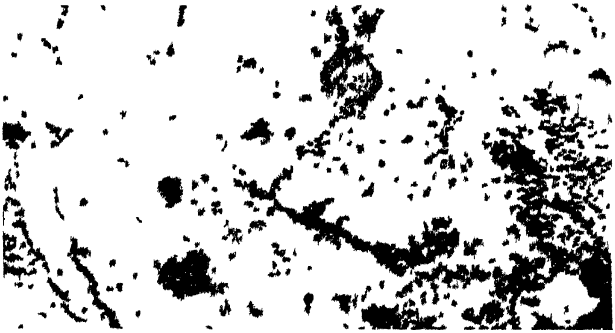

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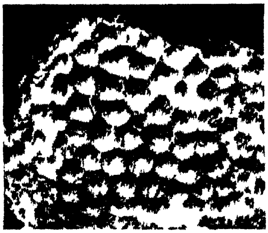

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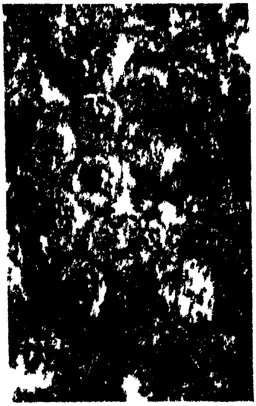

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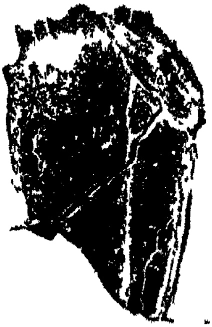
HYDROKERION AND HYDROCONOPHORA

GLAESSNER & WITHERS *Ann. & Mag. Nat Hist. S. 10. Vol. VIII Pl XX*



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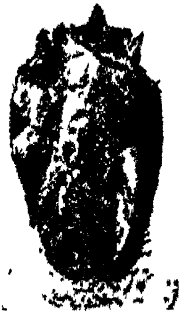

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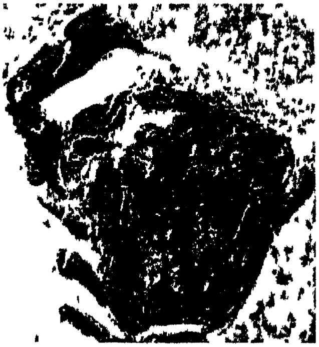

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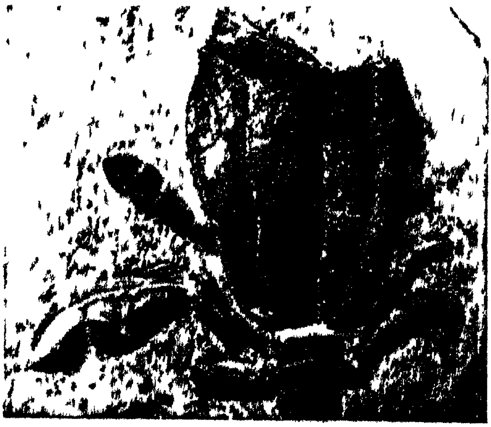

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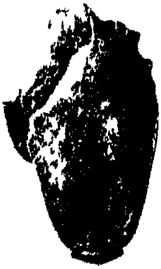
H G Herring, photo

LAEVIRANINA



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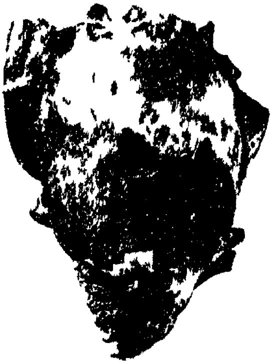

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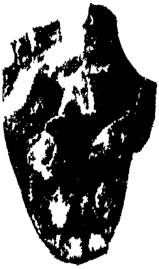

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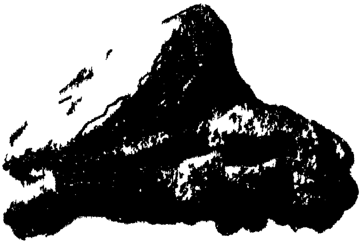

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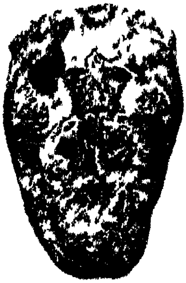

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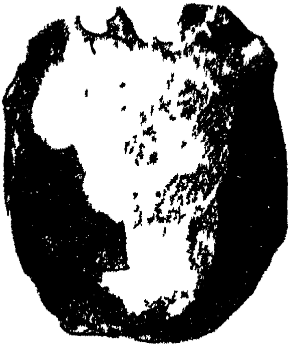

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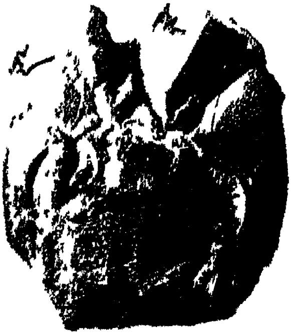

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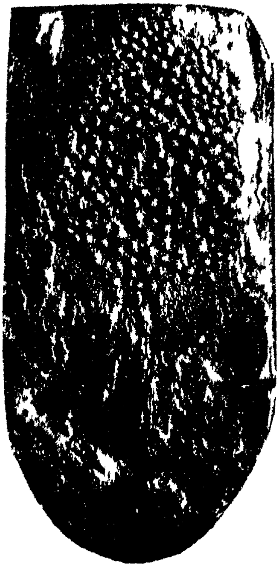

Conchopoma sp. (R 2661). Parasphenoid, ×2.5.

I. A. R. I. 75'

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